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ABSTRACT

The purpose of this module is to engage students (grades 7-8) in examining issues that underlie the "energy crisis" and in considering value aspects involved in decisions regarding energy consumption, distribution, sources, and other energy-related issues. The module is comprised of three parts, each focusing on a current, major source of fuel energy and its related issues. These include oil and transportation, nuclear energy, and coal. To demonstrate some of the many aspects of the subject, dilemmas or role-playing situations highlight the effects and problems posed by increased consumption of these fuels. Dilemmas are brief stories posing a critical decision to be made by a main character. This decision revolves around conflicts between two or more moral/ethical issues (as identified by Kohlberg) presented in the situation, and it is the moral/ethical implication that provides the thrust for later student discussions. Preceding each dilemma are readings/case studies providing background information regarding issues in the dilemmas. Questions are also provided to stimulate thinking about the issues and generate discussions. The module may be used as a separate unit of study, as a mini-course, or incorporated into social studies, general science, earth science, health education, or language arts courses. (JN)

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PREPARING FOR TOMORROW'S WORLD

ENERGY:

Decisions for Today and Tomorrow

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Preparing for Tomorrow's World
An Interdisciplinary Curriculum Program

Coastal Decisions: Difficult Choices
Energy: Decisions for Today and Tomorrow
Future Scenarios in Communications
Space Encounters
Technology and Changing Life-Styles
Food: A Necessary Resource
Perspectives on Transportation
Future New Jersey: Public Issues and the Quality of Life
People and Environmental Changes
Environmental Dilemmas: Critical Decisions for Society
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Beacon City: An Urban Land-Use Simulation
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PREPARING FOR TOMORROW'S WORLD

Energy:
Decisions for Today and Tomorrow

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PREFACE

We live in an exciting, rapidly changing, and challenging world—a world highly dependent upon science and technology. Our world is changing so rapidly that we sometimes fail to recognize that much of what we today take for granted as common, everyday occurrences existed only in the imaginations of people just a few short years ago. Advances in science and technology have brought many dreams to fruition. Long before today's school children become senior citizens, much of today's "science fiction" will, in fact, become reality. Recall just a few accomplishments which not long ago were viewed as idle dreams:

- *New biomedical advances have made it possible to replace defective hearts, kidneys and other organs.*
- *The first air flight at Kitty Hawk lasted only a few seconds. Now, a little over half a century later space ships travel thousands of miles an hour to explore distant planets.*
- *Nuclear technology—of interest a few short years ago because of its destructive potential—could provide humankind with almost limitless supplies of energy for peace-time needs.*
- *Computer technology has made it possible to solve in seconds problems which only a decade ago would require many human lifetimes.*
- *Science and technology have brought us to the brink of controlling weather, earthquakes and other natural phenomena.*

Moreover, the changes which we have been experiencing and to which we have become accustomed are occurring at an increasingly rapid rate. Changes, most futurists forecast, will continue and, in fact, even accelerate as we move into the 21st Century and beyond. But, as Barry Commoner has stated, "There is no such thing as a free lunch." These great advances will not be achieved without a high price. We are now beginning to experience the adverse effects of our great achievements:

- *The world's natural resources are being rapidly depleted.*
- *Our planet's water and air are no longer pure and clean.*
- *Thousands of plant and animal species are threatened with extinction.*
- *Nearly half the world's population suffers from malnutrition.*

While science and technology have given us tremendous power, we are also confronted with an awesome responsibility: to use the power and ability wisely, to make equitable decision tradeoffs, and to make valid and just choices when there is no absolute "right" alternative. Whether we have used our new powers wisely is highly questionable.

Today's youth will soon become society's decision-makers. Will they be capable of improving upon the decision-making of the past? Will they possess the skills and abilities to make effective, equitable, long-range decisions to create a better world?

To the student:

This module has been prepared to help you—the student and future decision maker—function more effectively in a rapidly changing world. Other modules in the *Preparing for Tomorrow's World* program focus on additional issues of current and future importance.

To the teacher:

It is our belief that this module—and indeed the entire *Preparing for Tomorrow's World* program—will help you the teacher prepare the future decision-maker to deal effectively with issues and challenges at the interfaces of science/technology/society. It is our belief that the contents and activities in this program will begin to prepare today's youth to live life to the fullest, in balance with Earth's resources and environmental limits, and to meet the challenges of tomorrow's world.

Louis A. Iozzi, Ed. D.
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PART I: ". . . Miles to Go, But How?" — Section A

Introduction

When we discuss the subject of energy we are referring to using energy to help us do work. Whether the work is growing crops, building bridges, running machines or driving to work, some type of energy is involved. For example, in getting bread to your table, energy is required to plow, plant and harvest the wheat, to produce fertilizers from oil, to ship the wheat to the mill, to grind the wheat into flour, to bake the bread and to package the bread, to advertise, and to deliver it to the grocery store. Energy is used in various forms such as sunlight (plants converting the sun's energy to food), oil, gasoline, and electricity, as well as human activity. Someone has calculated that the amount of energy used in the United States is equal to each American having 300 personal servants.

The growth of the United States has depended upon a large supply of cheap energy. In the early days the great forests provided energy to heat homes and for the blacksmiths to make tools. Later, coal became the major source of energy and large industries entered the American scene. Coal also changed our means of travel. Trains and steamships made possible more rapid delivery of products and in a sense brought the country closer together. One did not have to locate an industry close to the source of raw materials; it could easily be shipped from a distant location. Petroleum brought an even greater change. Oil was abundant and cheap and could be used for heat, generation of electricity, powering labor saving machines and for transportation (railroad, ships, trucks, automobiles).

With plentiful fossil fuels (coal, oil, gas) the U.S. progressed rapidly as an industrial nation. Human energy was replaced by machines which were able to produce products efficiently and at lower costs. Jobs that required hundreds of people could now be done by machines. New products were produced that required less human energy but more oil and other fossil fuels. Plastics replaced wood; nylon and other synthetic materials replaced cotton, wool and silk, and detergents replaced soap.

The U.S. has thus become a nation dependent upon great amounts of inexpensive energy, primarily energy in the form of fossil fuels. We today, however, are hearing of an energy crisis. Wherever we turn we hear and read about the need to save energy. What is an energy crisis, and what does it mean? What are we trying to save? Why should we be concerned about saving energy? These questions and others will be considered as we proceed through the following activities and readings.

Student Activity 1: a 125-Year Picture of Energy Changes

TABLE 1.
U.S. Energy Consumption Patterns, 1850-1979 (percent)

Year	Coal	Petroleum	Natural Gas	Hydropower	Nuclear	Fuel Wood
1850	9.3	—	—	—	—	90.7
1860	16.4	.1	—	—	—	83.5
1870	26.5	.2	—	—	—	73.3
1880	41.1	1.9	—	—	—	57.0
1890	57.9	2.2	3.7	.3	—	35.9
1900	71.3	2.4	2.6	2.6	—	21.1
1910	76.8	6.1	3.3	3.2	—	10.6
1920	72.8	12.2	3.9	3.6	—	7.5
1930	58.7	23.2	8.5	3.4	—	6.2
1940	50.1	30.0	10.9	3.7	—	5.3
1950	36.7	38.4	17.5	4.1	—	3.3
1960	22.8	45.0	28.5	3.7	—	—
1970	19.2	43.9	32.7	3.9	.3	—
1971	18.2	44.2	32.9	4.1	.6	—
1972	17.3	45.8	32.0	4.1	.8	—
1973	17.8	46.5	30.5	4.0	1.2	—
1974	17.8	46.2	30.4	4.0	1.9	—
1975	18.8	46.0	28.4	4.4	2.4	—
1976	18.4	47.2	27.3	4.1	2.8	—
1977	18.4	48.6	26.0	3.3	3.5	—
1978	18.0	48.6	25.3	4.0	3.8	—
1979	17.0	45.8	28.7	3.9	3.7	—

Source: Historical Statistics of the U.S., Bureau of the Census; U.S. Bureau of Mines, Washington, D.C., 1974, and U.S. Dept. of Energy, "Monthly Energy Review," July 1979.

Use the information on the previous page to construct a graph describing our changing energy sources in the past 125 years. (A graph worksheet will be distributed by your teacher.)

Use the graph worksheet with the coordinates labelled. Time in years is measured along the X-axis (horizontal) and percent of total use is measured along the Y-axis (vertical).

Select a different color for each energy source and label the key accordingly. Start with the data on coal. For each year, find the corresponding percent unit on the graph and place a small circle at that point. Do this for each year and connect the points. Do the same for each of the other energy sources. Use your completed graph to answer the questions below.

1. What was the main source of fuel in 1850? _____; in 1950? _____

2. What were some other sources of energy in 1850 that are not shown on the graph? (What were the energy sources for light, transportation, etc.?)

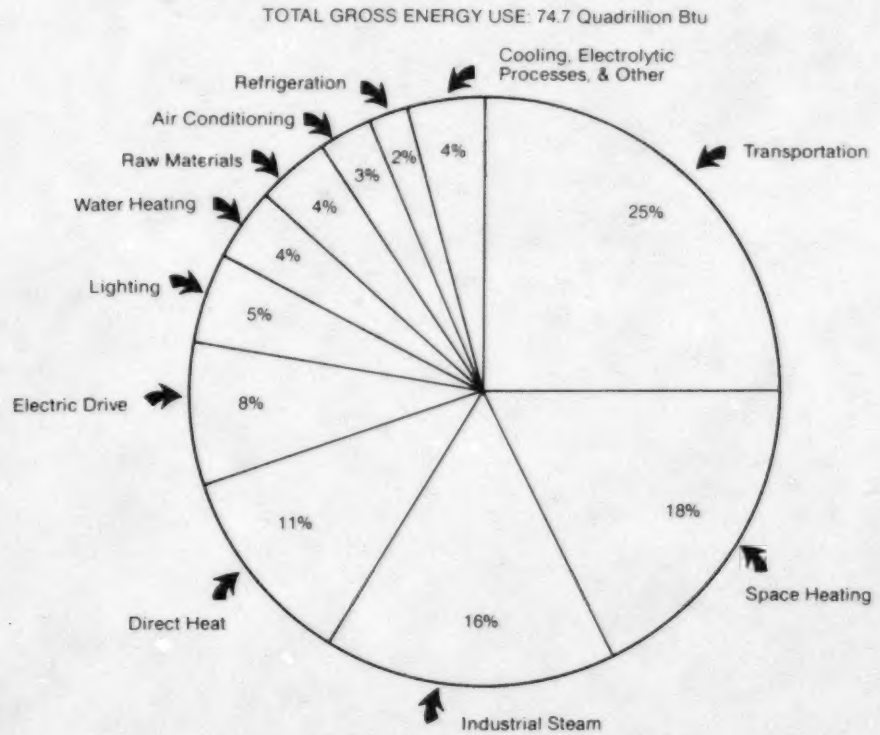
3. What do you think are some of the reasons that the use of wood dropped rapidly in the late 1800s?

4. What do you think was the major use of coal in 1900? How do we use coal today?

5. What energy source seems to be of increasing importance today?

Student Activity 2: How Do We Use our Energy Today?

Graph 1: U.S. Gross Energy End Uses, 1973



Source: U.S. Energy Prospects: An Engineering Viewpoint, National Academy of Engineering, 1974, page 26.

Study the "pie" chart which describes U.S. major energy uses in 1973.

1. What percent of the total energy use goes into various types of heating?

2. List some manufactured products that you use which require a heating process.

3. Why do you suppose that one-fourth the energy used in the U.S. goes into transportation?

4. If such a chart were made for energy uses in 1850, what do you suppose would be the major categories of different uses? What categories would not appear?

5. For the following uses, what are the fuel sources: a) transportation? b) space heating? c) lighting?

Student Activity 3: World Energy Uses

A. Graph 2: World Energy Consumption by Source, 1960-75

Examine Graph 2 and complete the following table: (use the handout which your teacher will distribute—DO NOT WRITE IN BOOK)

Changes in World Fuel Sources
(percent)

	World			United States	
	1960	1975	Change	1975	U.S. Compared to the World
Coal	47%	29%	↓	18.8%	less
Petroleum					
Natural Gas					
Hydropower					
Nuclear					

• From Graph 2 find out how much of the total world fuel is supplied by each of the five major fuel sources in 1960 and 1975. To find the percentage number, simply read off those numbers for each fuel source that appear above the years 1960 and 1975. Enter the percentage number in the appropriate space in the table.

• Under the "change" column use an arrow to show how the fuel source has changed: (↑) if there is an increase and (↓) if there is a decrease. (Note: Since we are comparing the percentage of each to the total, we find that coal's share of the total fuel consumed has decreased. However, the actual amount of coal consumed has increased. It simply has not increased as fast as other fuel sources.)

• To complete the column "U.S. 1975" use the data from Table 1 on page 1.

• Compare the extent the U.S. uses each fuel to that of the rest of the world. Is the fuel used to a "greater" or "lesser" extent in the U.S.? Indicate this under the column "U.S. Compared to the World."

• What fuel is the world using more of today than in 1960? What fuel is the U.S. using more of? Give some reasons for this.

B. Graph 3: World Energy Consumption by Region, 1960-75

• Compare the energy usage in 1960 and 1975. What regions have used a larger share of the total amount of energy?

• What regions have decreased their energy consumption in terms of total world consumption? Does this mean they are using less energy?

• Approximately how much has energy consumption increased in the 15 years since 1960?

• If energy consumption continues to increase at the same rate for the world, how many quadrillion BTUs will be consumed in 1990? (A BTU—British Thermal Unit—is a heat measurement. It is the amount of heat required to raise the temperature of 1 pound of water 1° Fahrenheit at a given pressure and temperature.)

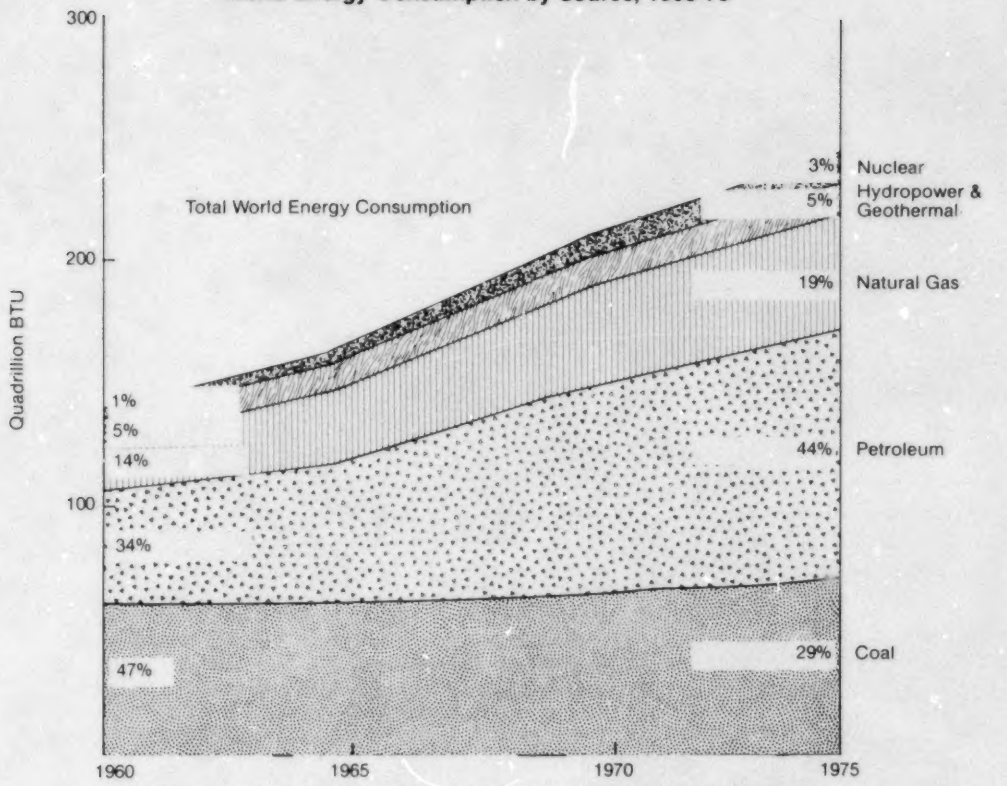
• Why do you suppose that Japan has doubled its energy consumption since 1960?

• The world's population is about 4 billion (4,000,000,000) and the U.S. has a population of 220,000,000. The U.S. population is therefore about 7% of the total world population. If the rest of the world uses as much energy as the U.S., calculate how many BTUs the world would have consumed in 1975 (use the figure 75 quadrillion BTUs for 1975, U.S. Consumption).

• Why do you suppose that the U.S.'s share of the total energy used in the world is so large?

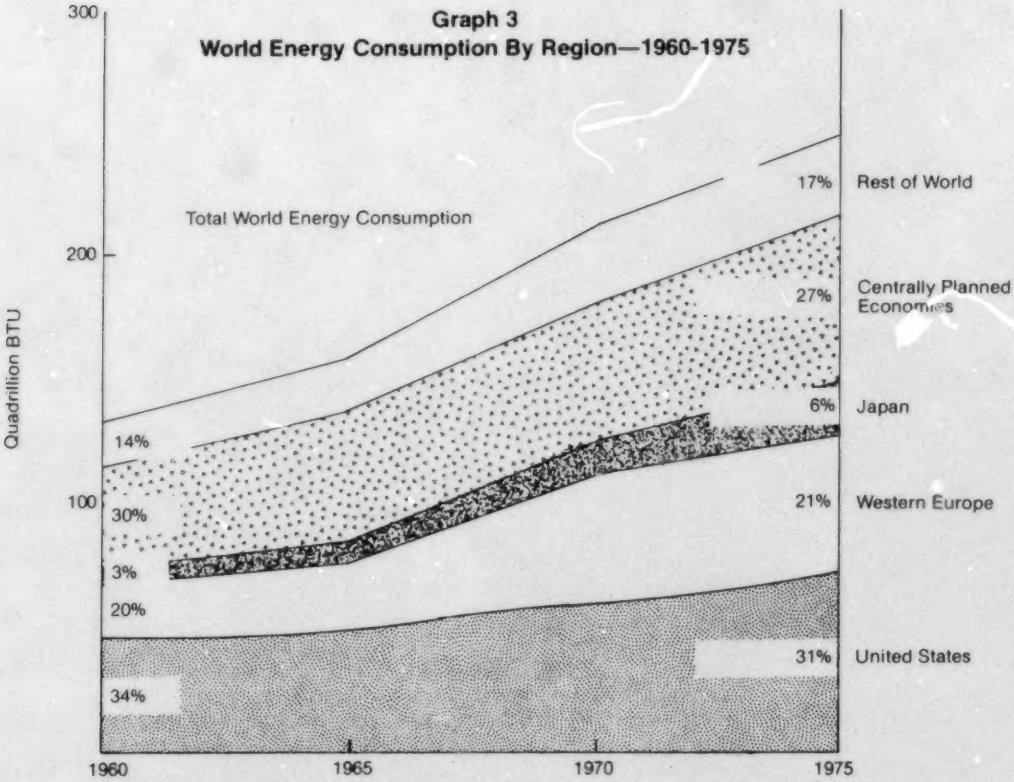
• If the United States uses less energy what changes will have to take place?

Graph 2
World Energy Consumption by Source, 1960-75



Source: Historical Data: United Nations, 1974; Projections: U.S. Dept. of the Interior

Graph 3
World Energy Consumption By Region—1960-1975



Source: Historical Data: United Nations, 1974; Projections: U.S. Dept. of the Interior

PART I: ". . .Miles to Go, But How?"—Section B

Student Activity 4: Dilemma Discussions

Dilemma 1: Who Has Oil to Sell?

The leader of Iduas, one of the five major oil producing countries, recently became concerned over the wide differences in living standards between the highly industrialized nations and the underdeveloped nations. He saw that millions of people barely get enough to eat, live in shacks hardly suitable for humans and die from lack of medicine and adequate health care. On the other hand, people in the industrial countries are able to speed about in fast cars, eat fancy foods from all over the world and enjoy homes equipped with heat, air conditioning, running water and TV sets. Much of the good life they enjoy comes from the use of oil to generate electricity, to run machinery and cars, to manufacture plastics and synthetic fabrics, and to produce heat. He felt that this gap between the rich and poor nations could be changed if the underdeveloped nations could industrialize and produce goods themselves as well as sell to others.

Iduas' leader met with the representatives from the other four countries and convinced them to discuss the problem. They agreed that conditions in the underdeveloped countries would improve drastically if they could buy oil more cheaply. A decision was made to increase the price of the oil they sell to the industrial nations as well as sell them less oil. The oil producers would then sell the remaining oil to the underdeveloped countries at a lower price. In this way the poor countries will have a better chance of catching up. However, to do this, they will break the agreements they have made with the nations who now buy oil from them.

Should the oil producing countries take this action?

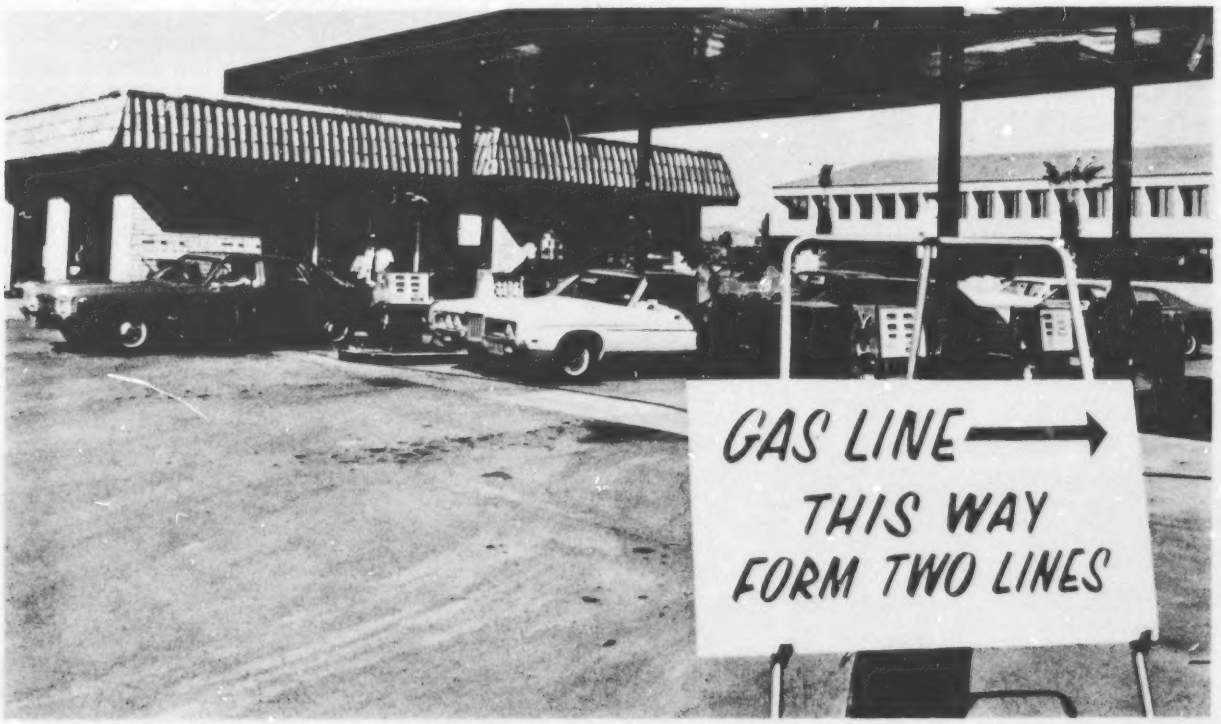
Drilling for Offshore Oil

Questions for Discussion (Dilemma 1)

- Does a country have a right to sell oil to whomever it pleases at whatever price it decides? Why or why not?
- Is it fair to charge some customers high prices and some customers low prices? Suppose your grocer decides to sell food to the rich at one price and the poor at another price; do you think that is fair? Why or why not?
- Since the oil companies from the industrial nations provided the technical knowledge and equipment for the discovery and drilling of the oil, shouldn't the oil producing countries now have some responsibility towards the countries that helped them? Why or why not?
- If a country has an important resource, should it share it equally with other countries that need it? Why or why not?
- If a country is willing to pay high prices for oil, should it be allowed to buy all it needs? Why or why not?
- People in rich industrial nations tend to waste a great deal of oil such as driving around unnecessarily, using plastic disposable containers (made from oil), keeping their homes very warm etc. Should they be allowed to continue to do so just because they can afford to live this way? Why or why not?
- Since oil is a resource that can't be replaced does one country have the right to use more of it than another country? Why or why not?
- Reducing oil supplies to industrial nations may force them to use fuel sources that are more potentially harmful to human health such as nuclear fuel or coal. Should the oil producers think of the health consequences when they decide to take such action? Why or why not?

Petroleum and Transportation

Dilemma 2: One Good (or Bad) Turn Deserves Another



The Gasoline Crisis

The oil producing countries decided to take the action of limiting the sales of oil to the industrial countries and charging higher prices. The industrial countries including the United States were outraged and indignant. They felt that they had done much to help the oil producing countries by helping them build roads, schools, electrical power plants, telephone systems and even their air force and army in exchange for the oil, and now they are being treated so ungratefully.

The industrial nations realized that this action would create an economic disaster. Higher priced oil would mean higher prices on everything—transportation, heating, plastics, medicine, food, etc. Food production would be greatly affected because oil is needed to run farm machinery, produce fertilizer and harvest, process and transport the food. Millions of workers would be out of work. The affected nations tried unsuccessfully to get the oil producers to change their minds. They felt that the only solution would be to use military force to make them reverse the decision.

Should the United States go along with the other nations in using this tactic? Why or why not?

Questions for Discussion (Dilemma 2)

- If the well-being of the country's people were threatened, doesn't the government have the responsibility to use whatever method necessary to make sure that its people will not lose jobs or go hungry? Why or why not?
- What responsibilities should a seller have to its long-time customer? Why?
- Does a buyer ever have the right to demand that a seller sell his/her product? Why or why not?
- Shouldn't the industrial nations appreciate the good intentions of the oil producers and consider making some sacrifices so that the underdeveloped countries can benefit from low priced oil? Why or why not?
- If a country depends on an important resource for its very existence, should the country with that resource feel some responsibility? Why or why not?
- If war results and many people are killed, who should be blamed? The countries with the oil? The countries needing the oil? Why?
- Oil is a very important source of heat; without heat in the winter many people living in colder areas would die. Should the oil producing countries be blamed for the deaths? Why or why not?
- Should a country become so dependent on a resource of another country that it has to go to war in order to get it? Why?
- What responsibility does the U.S. have to its friends, the nations who want to use military threat? Why?
- Without the military strength of all the countries combined the threat would not be effective. Should the U.S. go along with the other countries? Why or why not?

Dilemma 3: "Do Unto Others . . ."

The action taken by the major oil producing countries has caused great changes in the United States Gasoline, a primary product of oil, has become very scarce. The President has ordered all unnecessary travel halted; each family is now limited to 20 gallons a month which is about one full tank of gasoline for the entire month.

Everyone has had to make drastic sacrifices. Persons living in the suburbs have been most severely affected; it is nearly impossible to drive to work, drive to shopping centers or take part in any activities farther away than a few miles. Many shops, restaurants, theatres and sports places have been forced to close because people simply cannot get to them.

At the Fern household in Wooded Lake there is a sudden crisis. Jenny, the youngest of the six children, has fallen off the backyard swing and injured her arm. Her mother thinks that it has been broken and that they should take her to the doctor in South Valley 30 miles away. But they have no gasoline; their monthly ration has been used up for a holiday trip to visit relatives.

Their only neighbors are old Mr. Spane and his wife with whom they are not on speaking terms. This is because the Spanes constantly object to the noisy activities of the children. Despite this feud, Mrs. Fern goes to the Spanes and asks them to drive Jenny to the doctor. Mr. Spane refuses, stating that they need all their gasoline for their weekly visits to the doctor and any possible emergency since they are both in poor health.

That evening Jenny's arm becomes greatly swollen and she doesn't stop crying because of the pain. Mrs. Fern wants to get her to the doctor and feels that the only thing she can do is to steal gasoline from the Spane's car. She will be taking a great risk because gasoline scarcity has made theft of gasoline a serious, major crime. Should she steal the gasoline? Why or why not?

Questions for Discussion (Dilemma 3)

- Is it ever right to steal? Why or why not?
- Should a mother be obligated to do whatever she can to help her children? Why or-why not?
- Should Mrs. Fern also think of her other children? Why? What if she were caught and sent to jail? Who would take care of them?
- The Ferns knew that taking the trip would mean no gasoline for emergencies. They took the chance; shouldn't they accept the consequences? Why or why not?
- What if stealing the gasoline prevented Mrs. Spane from getting to the doctor for an important treatment, and she had died as a result. Should Mrs. Fern be held responsible for her death? Why or why not?
- If you were Mr. Spane, should you give them the gasoline? Why or why not?
- Suppose Mr. Spane catches Mrs. Fern stealing, should he report her to the police? Why or why not?
- What if Mrs. Fern gets caught and is brought before the judge; should the judge give her the same penalty that he gives anyone else caught stealing gasoline? Why or why not?
- What if the neighbors were good friends; should that make any difference in Mrs. Fern's decision? Why or why not
- How should neighbors act towards one another? Why?
- If you were Jenny, would you try to stop your mother from stealing? Why or why not?

"No Gas"— A Continuing Problem

Dilemma 4: Ted's Dilemma

Ted Bates finally has managed to "save up" enough gasoline to take Julie Dean, his girlfriend, to the football game and dance in Kingston next weekend. This was the big event they had long planned. He obtained the gasoline by doing errands for his parents that would otherwise require the use of the family car. These errands included carting groceries from the store 5 miles away; hiking 20 miles to deliver books for his father; carrying his baby sister to the doctor for checkups.

As he leaves his house to tell Julie the good news, Mrs. James, who lives next door, calls him. Mrs. James is among his favorite persons, having been like a grandmother to him since his early childhood. She continues to be her cheerful self despite her cancer illness which requires radiation treatment weekly. Mrs. James explains her reason for the call. Her appointment for the treatment is today, but she feels too weak to take the bus and there is no other way for her to get there. She wants Ted to give her a ride knowing that he has extra gasoline. Moreover, she offers to pay him well for his efforts. In fact, the payment she offers is equal to what he earns working two days at the cleaners.

However, if he takes Mrs. James to her appointment he will not be able to drive up to Kingston next weekend. Should he agree to give Mrs. James the ride? Why or why not?

Questions for Discussion (Dilemma 4)

- What should Ted take into consideration before making his decision? Why?
- Is it fair of Mrs. James to make this request? Why or why not? What would you do if you were Mrs. James?
- If they cannot attend the game and dance, should Julie blame Ted? Why? Should she blame Mrs. James?
- Since Ted worked so hard to save up enough gasoline, shouldn't he benefit from his efforts? Why or why not?
- If Mrs. James becomes seriously ill because she couldn't get to her treatment, should Ted be blamed? Why or why not?
- Should the amount of money Mrs. James offers to pay make a difference in Ted's decision? Why or why not? What if she offers twice as much? What if she cannot afford to pay Ted?
- Should Ted discuss this with Julie before making his decision? Why or why not? What if Julie tells Ted that she will never speak to him again if they can't go to the dance? Should that affect Ted's decision? Why?
- Suppose Ted gives Mrs. James a ride and uses up much of the gasoline. Should he tell Julie what actually happened or should he tell her he was not able to save enough gasoline for the trip? Why or why not? What explanation might be easier for Julie to accept?
- What obligations does Ted have towards Mrs. James? Why? What if it were his grandmother or another relative asking Ted this favor? Should it make a difference in his decision? Why or why not?
- Suppose Ted had also promised to drive four other people to Kingston. What responsiblility does he have to keep his promise? Why?

Student Activity 5: A Topic for Debate: The Mayfair Project

The recreation complex was to be Mayfair's largest community building project. It would include an indoor-outdoor swimming pool, bowling alleys, ball fields, tennis courts, game rooms and social hall. The community felt that such a complex would be the answer to the constant complaint of the townsparents that the children had no where to go and nothing to do. If the children had more recreational activities there would be fewer kids getting into trouble and less vandalism.

The sudden fuel crisis caused the town officials to reconsider their plans. They felt that in addition to the high cost of constructing such a facility, there was the problem of fuel requirement to keep the pool heated, the building warm, the rooms lit, the grass mowed and the electrical machinery operating.

The officials decided that the money set aside for this complex could be better used to develop a mass transit system for the community which had relied solely on private automobiles. The mass transportation system would consist of buses and jitneys (small 16-20 passenger buses) and serve to make it easier for the residents to do their shopping and other errands. This mass transit would be of special importance to the people who lived in outlying areas of the community and because of fuel scarcity had great difficulty shopping and getting to work. It would also help revive some of the businesses that had depended on people being able to use their cars freely, such as the fast food drive-ins and movie houses.

The proposed transit plan greatly upset many town citizens, especially those with children. A group of citizens joined together to fight the transit plan. They presented their arguments at the town meeting but were unable to convince the town leaders to change their minds. The supporters of the recreation complex were determined to continue their battle against the transportation proposal. From their point of view recreation should be the most important concern of the town.

What should the town officials do?

Use the preceding situation as a topic for a class debate: Community Center vs. Mass Transit System

A. Debate Format 1

1. Select a team (4 to 6 member) to argue for the Community Center and one to argue for mass transportation.

2. Determine how much time should be allotted to each debater. Also, after all arguments have been heard each team member should be given time to present a counter argument or rebuttal.

3. The other members of the class will serve as judges. Each judge will construct a score sheet similar to the one below for scoring the debaters. Points will be given for each item. Use 5 points as the highest possible score for each item.

Community Center Team	style of presentation	organization of argument	use of information	strength of argument	subtotal
1.					
2.					
3.					
4.					
5.					
6.					
			total		
Mass Transportation Team					
1.					
2.					
3.					
4.					
5.					
6.					
			total		

In scoring each item consider the following:

Style of Presentation

- Does the person speak clearly and smoothly?
- Is the speaker poised?
- Does the speaker seem to believe in what he/she is saying?
- Does the speaker figet or make distracting movements?

Organization of Arguments

- Does the speaker organize his/her ideas well? Or does he/she jump from one idea to another randomly?
- Are the points made clear and easily understood?
- Is the argument well thought out?

Use of Information

- Does the speaker seem to know what he/she is talking about?
- Are facts and other information included
- Do the facts help to support the argument?

Strength of Argument

- How convincing are the arguments? Do the arguments persuade you to support the speaker's position?
- How important are the arguments? Does the speaker agree about unnecessary details?
- Does the speaker's point come across strongly?

Scoring

- Record a score for each speaker under each of the items. Each speaker will have four scores.
- Add up the four scores and record the amount under the "subtotal" column. The highest possible score is 20 (i.e., 5 x 4)

5 = excellent 2 = fair
4 = very good 1 =poor
3 = good

- Add up the subtotal column to obtain the total team score.
- The team with the highest total (total score of all the judges) will be declared the winner.

B Debate Format II

- The class will form two teams—one for the Community center and one for Mass Transportation.
- The teams should be seated facing one another.
- Arguments will be presented by a team member from one side then a team member from the other side. Arguments are presented alternately until all students have had an opportunity to speak.
- Each speaker will be allowed one minute. (A person should be selected to be time keeper.)
- This debate should be a spontaneous activity. Teams should not prepare in advance but try to develop the arguments as the debate progresses. Each student will need to listen carefully to the arguments that are presented and introduce his/her own new idea.
- In this type of debate the object is to try to think and organize ideas quickly. It is almost like "brain-storming" where someone presents an idea and that idea leads to another idea. Each debater can build his/her idea from the previous idea or present a totally different idea.
- After all arguments have been presented the class will then discuss some of the main points that were brought out by each side. What were the best arguments presented by each team?

C. Questions for the Debater

The following questions may be helpful for each team to consider in preparing arguments.

- How does a community center or a mass transportation system benefit a town?
- What are the advantages of each?
- If the cost of energy doubles in five years, how might a community center or mass transportation system be affected?
- What is more important to the town now? In five years?
- Is recreation a necessity or a "frill"? Transportation?
- If a town has only so much money to spend, how is the money best spent?
- How can the townspeople best help to conserve energy?

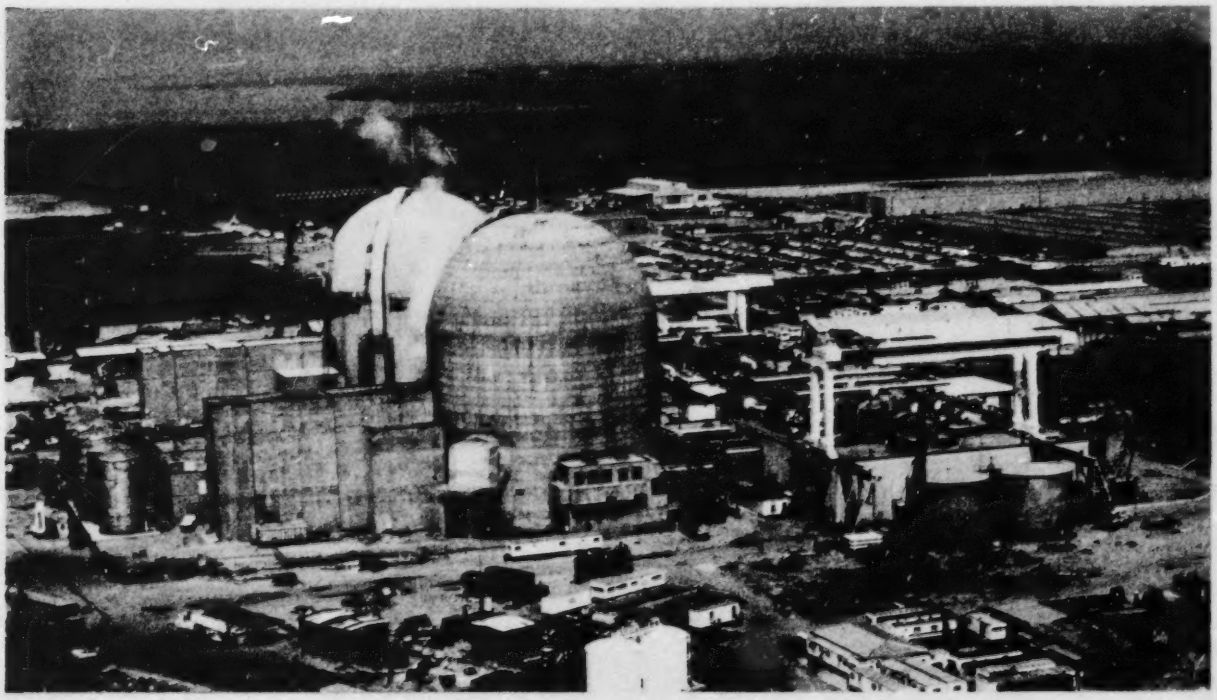
PART II: The Nuclear Power Controversy — Section A

Student Activity 1: The Beekertown Vote

As citizens of Beekertown you are about to vote on a proposal that will have important effects on you and your neighbors. The Metropolitan Electric Company plans to build a nuclear-fueled power plant 20 miles from the center of town. Your vote will help to decide on the fate of the proposed plant.

Many different and new changes will come about if this plant is approved. Therefore, consider the issues carefully and discuss the question among yourselves before coming to a final decision.

To give you some ideas on how other communities have wrestled with this question, read the following transcript of a tape recording of the town meeting at Lakeview. Or, class members may take the different parts and act out the town meeting. At this meeting people from all sections of the town have come to give their opinions about the building of the nuclear plant. Examine each of the opinions critically and use the worksheet #1 to help you reach your own decision. The situation at Beekertown is nearly identical to that at Lakeview.



Nuclear Power Plant

Reading 1: A Transcript from Lakeview Town Meeting—Proposal: The Construction of Lakeview Nuclear Power Plant

Mrs. Milton: There is no question that the present power generating plants supplying our area are old and can't produce all the electricity that our town needs. Most of you probably remember what happened during the hot spell last August. It was unbearable without air conditioning. When we all had our air conditioners on full blast, the increased electricity load proved too much for the system to handle, and we were "blacked out" for two days. Having no lights wasn't too bad, but what was worse was that we couldn't cook. There was no hot water for showers, and when the freezer defrosted, I had to throw out my frozen vegetables that had just been harvested from our garden, not to mention all of our meats.

Mr. Shoar: Yes, indeed, do I remember that calamity! With my arthritis I couldn't get up to my tenth floor apartment without the elevator and had to camp out in the lobby of the building. Half of the people in the building were down there! Even the people who could get up to their apartment weren't any better off. With the water pumps out of service there was no way to get water upstairs unless you carried it yourself. Those people upstairs couldn't even flush their toilets!

Mrs. Leon: The electrical utilities have put in more safety devices to keep that from happening again. But we still have to put up with those annoying brownouts when they cut back on power. And the brownouts always come at the most inconvenient times—when I'm cooking dinner, or in the middle of my favorite TV show, or when the kids are doing their homework at night. Have you noticed that there are more and more brownouts in the last few months—ever since they built that new section of houses and the new refrigerator assembly plant came into town?

Mr. Adams: I think that the nuclear generating plant is going to be a good thing for all of us. Electricity from the gas generating plants has been getting more expensive every year. On my social security pension I can't afford much of anything else after paying the rent and electric bill. I don't know what I can do if it goes any higher. Last winter I turned my electric heater down as low as I could stand. But I have asthma and rheumatism and have to keep the rooms warm.

Electricity from a nuclear generator will be quite a bit cheaper. Our taxes also could be lowered because the New nuclear plant would be selling electricity to our neighboring town. Taxes from that will mean that the town wouldn't need to collect as much tax money from our local people.

Mr. Jacobs: I think sometimes we should learn to give up a few of our modern age comforts and conveniences and perhaps try to cut back on the amount of electricity we use. There are some things money can't buy. I'm talking about Stevens Lake where they plan to build the nuclear plant. The lake has the best trout fishing and swimming in all of Tatum County. Water will be needed to cool the nuclear generator, and the water going back into the lake will be several degrees warmer. No one knows for sure what might happen to the lake by increasing its water temperature. Warmer waters can lead to increased growth of algae and bacteria and cause changes in the numbers and types of fish that live there.

I don't want our natural recreational area changed and marred by that monstrous concrete and steel generating structure.

Mr. Fetter: I agree with Mr. Jacobs. It's vitally important to protect our natural lands from such drastic changes. Building the plant doesn't end with just the plant alone. High voltage transmission lines will be needed to carry the electricity. Roads will be widened to permit the heavy truck traffic. Large parking lots will be needed for the plant employees' cars, and the entire area will have to be fenced off and heavily guarded to prevent intruders or possible saboteurs.

Mr. Hayes: As mayor of the town, my concern is to see to it that the community has sufficient electricity to satisfy its needs and has enough for future needs. We all want our town to grow and prosper and that won't happen if we don't have enough electricity. A nuclear generator has less an effect on the environment than any other type of electricity generating plant now in general use. You can see for yourself the smoke that comes out of our oil generating plant. With an oil shortage we might have to change to coal generators and that will even make the air worse. Let me give you some facts: a typical fossil fuel plant generating 1000 megawatts of electricity throws out into the air each day several hundred tons of particulate matter, sulfur dioxide, Nitrogen oxide and ash as well as carbon monoxide. To keep a coal generator operating railroad cars will be running day and night to bring in the coal ore.

Mrs. Cantor: If our town allows a new generating plant to be built, that plant can't be smokey and dirty. The air around the town is bad enough with our coal burning steel mill. I just read in a recent study that places with high air pollution have many more cases of lung disease and deaths as a result of the disease. Children and older people are more easily affected, and I don't want anything that might risk the health of my children.

A nuclear generating plant doesn't throw out dirty smoke with carbon monoxide and sulfur. Sulfur dioxide is what causes our cars and other metals to rust so quickly around here. If it does that to our metals, can you imagine what it does to our lungs?

Mr. Anders: You have some very good arguments against coal generators, Mrs. Cantor. And I must admit I agree with you wholeheartedly. In terms of the visible effects on the land and air, nuclear fuel is by far the cleanest. I am, however, a bit concerned about the small amounts of radioactivity that do come from the nuclear plant. That amount is very little compared to the amount of radioactivity every person is naturally exposed to. This is called background radiation and comes from radioactive elements that are part of the earth and from radiation from space. Background radiation amounts to about 80 to 200 millirems per person per year. Radiation from nuclear plants is about 5 millirems. Dental X-rays or X-rays to detect broken bones often amount to 50 millirems for each examination. We know that radiation is one of the causes of cancer and defects in our genes. The amount of additional radiation from nuclear plants may be very small, but I don't know how much that would increase our chances of getting those diseases. And what if there were a plant accident—then very large amounts of radiation could leak out.

Mr. Dalton: As the representative from the power company, let me assure you that radiation leakage has never been a problem at any of our other plants. Our plants operate under the strictest of safety regulations. The level of radiation inside and outside the plants is constantly being monitored. In fact, the level of radiation in the water leaving the plant is less than 10% of the maximum allowed by the government agency. The plants are designed to guard against any possible accident that we can imagine. No other type of industrial plant has so many safety measures—we "over-engineer" our plants.

Mrs. Spencer: I come from the Cleaver Knitting Mill Company. Our company has been looking for a new plant site and your community has been found to be the ideal spot for our new location. You have good roads and rails for transporting our materials and many available workers, and the area is an attractive place for living. The only problem is that there is not enough electric power to run the mill. If you provide a good source of power, I can promise you that Lakeview will be our next home. You will benefit from more jobs and more income for your town.

SAMPLE

Use the Handout distributed by your teacher. DO NOT WRITE IN BOOK.

Worksheet #1—*Identifying the main arguments presented at the Lakeview Town Meeting*

1. In a summary form list the arguments "for" and "against" allowing the nuclear generating plant to be built in the area. E.g., "for"—need for electricity; "against"—change natural environment

2. According to your opinion, how important is that reason? Indicate the level of importance with a number from 1 to 4 in the "importance" column.

4 — most important 3 — much importance 2 — some importance 1 — no importance

For	Importance	Against	Importance

Committee Discussion

- The class will divide into small groups (of 3-5) to discuss the opinions presented at the Lakeview Town Meeting. At the beginning of the group meeting, each student will complete worksheet #1.
- During the small group discussion discuss what you think are the best reasons for supporting or rejecting the proposed plant. Discuss whether the opinions given at the Lakeview Town Meeting are important considerations for your town, Beekertown.
- Use worksheet #1 which you have completed to help you identify the important opinions. From your other readings and study activities you may find additional reasons for making a decision about a nuclear power station in your town. Present these in the discussion.
- Each group will try to come to an agreement on whether or not to allow a nuclear power station to be built at Beekertown, and select the best reason for making such a decision. If no agreement can be reached, select the best reasons from each of the opposing sides.
- Choose one member from your group to present the group's decision at the Town Meeting. He/she will give a summary of your group's discussion and include the reasons why the decision was made. This summary should be no longer than 5 minutes in length.

Class Discussion: Beekertown Town Meeting

- The class will meet as an entire group to simulate the Beekertown Town Meeting. Each person in the class will represent a citizen in Beekertown.
- A member from each of the small group committees will present a summary of the group's opinions. This presentation should not be longer than five minutes.
- After all the presentations have been made, you, as Beekertown residents, will have an opportunity to ask any additional questions.

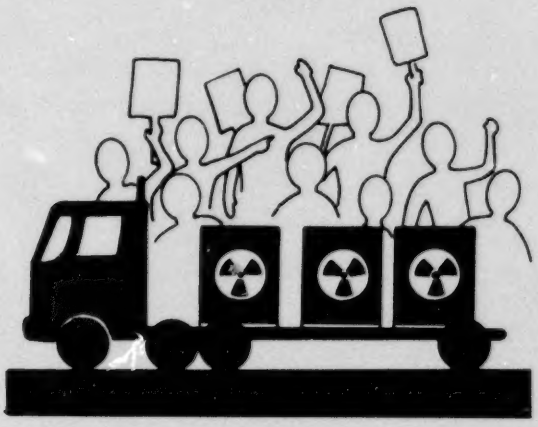
The Vote at Beekertown

- Each Beekertown citizen will cast his/her vote "for" or "against" the proposed nuclear power plant by a secret ballot. One does not have to vote according to the decision made at the committee discussion.
- A moderator will count the votes and announce the results. Would you have predicted this result after hearing the different committee speeches?
- The Lakeview townspeople voted in favor of the nuclear plant. Did Beekertown arrive at the same decision? If not, why do you suppose the town voted differently?

Questions for Class Discussion

- What decision should be made so that the needs of the townspeople are best served? Why? What needs should be more important than others?
- If the town could not obtain sufficient electrical power, what group/groups of users should be asked to reduce their electricity usage? Why?
- Should preserving the land in its natural state ever interfere with the growth and progress of a community? Why?

Reading 2: An Unexpected Dilemma for Lakeview



Present-Day Lakeview:

The Lakeview nuclear power plant has been in operation for a number of years now. The local residents are generally quite satisfied with this development. New industries have moved into the area, bringing with them new jobs and adding new taxes to the local government. The landowners are particularly happy with the rise in their land values; many, in fact, have recently sold large parcels of land for new housing developments to provide homes for the recent arrivals. At first some townspeople were quite fearful of the nuclear reactor but now they seemed to have become used to the idea and have accepted this as a fact of life.

Scene I: Two Hundred Miles From Lakeview:

County Highway 237 is clogged with cars as far as the eye can see. Traffic is barely moving, if at all. The cars have bumper stickers which read "Too Hot for Our Roads" or "Radioactivity—Not for Our Roads," and the chanting of "Keep them off our roads" carries over the hum of the auto engines. Tom Jones, newscaster for Station WRAC, is interviewing the motorists:

Tom Jones, Newscaster: Can you tell me what is taking place here? Why have so many people come to stage this traffic slowdown demonstration?

Demonstrator One: We have come to fight for the health and safety of people who use this road or live close to it. We are going to put a stop to trucking radioactive waste materials on our roads.

Newscaster: Where is the radioactive waste coming from and where is it going?

Demonstrator One: It's from the nuclear power plant up in Lakeview. You know that uranium, the fuel for a nuclear plant, doesn't get all used up. The unused fuel and leftover waste products from a nuclear reaction contains several new types of radioactive elements, including plutonium. This waste is among the most deadly substances known. It is being taken to be stored in a safe place or to a reprocessing plant where usable uranium can be separated out and put into new fuel rods.

Newscaster: Why are you so against transporting this waste? It has to be taken away.

Demonstrator One: Well, radioactive materials just don't belong on the roads. There are simply too many chances for accidents. Do you know what might happen if one of those trucks had an accident and one of the containers broke, spilling radioactive materials all over the area? The substance released is like that from a nuclear bomb. People close to the accident will be exposed to high doses of radiation and will die from radiation sickness. People further away will be exposed to lesser amounts but any increased exposure to radiation will increase the chance of getting cancer. Others will not become sick but radiation can cause genetic defects and when people have children, the children could suffer from serious defects.

Newscaster: What makes you think that an accident could happen? Aren't the trucks well protected against the possibility of accidents?

Demonstrator One: Sure you can guard against accidents but you can't absolutely prevent accidents! It's like wearing seat belts to make it safer when riding in cars. You're reducing the chance of getting seriously hurt. But, just because you have a seat belt on doesn't mean that you wouldn't run into another car or that another car wouldn't run into you. No one can prevent the truck driver from blacking out or suffering a heart attack. So they have a back-up driver who could take over—but what about other drivers on the road? How can you order back-up drivers for everyone on the road?

Demonstrator Two: There is also the possibility of people stealing the radioactive material for making bombs. Nuclear bombs are not that difficult to make once one gets hold of plutonium which is part of the waste "spent" fuel. Terrorist groups can easily hijack planes. They can, just as well, steal a shipment of waste materials or the enriched fuel that has been reprocessed at the reprocessing plant. It's not possible to guard every inch of the road. Even guarded areas can be broken through!

Newscaster: It seems to me that bringing fuel rods in and taking out the "spent" fuel and other waste products are part of the process of generating electrical power from nuclear reactors. Don't you think that if people want electricity, they must accept some of these risks?

Demonstrator Two: Not at all. We feel that the risk in this case is just to great. One tiny speck of plutonium getting into the lungs can cause death. What's more, the radioactivity of plutonium can be considered as lasting almost forever. It takes over 24,000 years for only half of it to lose its radioactivity. That's a long time!

(Newscaster walks over to interview Demonstrator in another car).

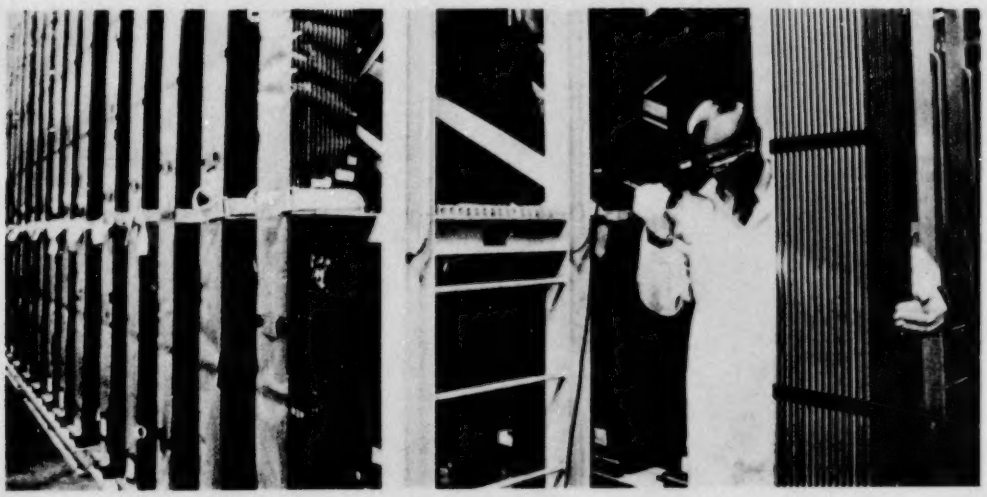
Demonstrator Three: We, too, do not see why we should suffer the possible consequence of a decision made by another town and the power company. We had no say in the decision. Nobody asked us! Why should their decision be forced on us?

Newscaster: I can see your point. But the electricity from the plant also goes to other communities. You probably use products made by companies that are also customers of that nuclear generator.

Demonstrator Four, Passenger in Second Car. We still feel that nuclear power is not a safe energy source, and right now we have to get the trucks off the road. Look at what the railroads have done. The Association of American Railroads has refused to transport radioactive waste on the grounds that it is too dangerous. If they ship the waste, they demand that special trains and crews be used and that the trains operate at much lower speeds and on different tracks. So if the railroads have recognized the dangers, there is even more reason for road users to do the same. Some of those trucks have to go many hundreds of miles to the disposal or reprocessing center. Roads don't only go through deserted areas but also through cities, across bridges, and into tunnels. There are people everywhere along the way.

Newscaster: What does your group suggest be done? The waste has to get to the storage center somehow.

Demonstrator Five, Passenger in Second Car. First things first, and the first step is to order all trucks carrying radioactive materials off the roads. If they can't use the roads, they will have to come up with another solution.



Fuel Rods

Scene II: Office of The Nuclear Regulatory Commission:

The action shifts to the offices of the Nuclear Regulatory Commission. The newscaster is interviewing a spokesman for the government regulatory agency and a representative from the power company.

Newscaster: You are well aware of the demonstration on Highway 237 that has created the massive traffic tie-up. I want you to tell the listeners what you think of the situation.

Spokesman: Personally, I feel that the demonstrators are acting much too emotionally. Just the word "radioactivity" and they are ready to shut everything down.

Shipment of radioactive waste is closely regulated and better safety measures are continually being developed. The materials are shipped in specially designed metal casks with layers of lead casing. They are constructed to shield people from radiation and to disperse the heat generated by radioactive decay.

The trucks carrying the casks are specially marked on top so that helicopters or planes can be used to watch their movement.

Newscaster: What might happen if the casks were involved in an accident?

Spokesman: We have considered such a possibility, so the design of the cask takes into account what we consider to be the worst possible situation. The casks can be dropped from a height of a three-story building onto concrete. That is like a crash at 60 mph. They can't be punctured from a fall of four feet onto a steel spike six inches wide. If there were a fire, the casks can stand heat up to 1475°F for half an hour. If they happen to fall into water, they can stay submerged for at least eight hours. I would think those are very high standards.

Newscaster: Have there been any accidents involving shipments of radioactive materials?

Company Representative: Yes, there have been a few minor accidents. But if you look at the statistics, you will find our safety record very good. In all cases there was no significant escape of radioactivity, nor was there any injury caused by radioactivity. One driver died, but that was from the crash and not from what was carried on the truck.

Newscaster: Nonetheless, even with all the safety regulations, do you think that such dangerous materials should be permitted on public roads? There is always a possibility that a danger was not considered in the safety design.

Spokesman: We are not the only ones who ship dangerous materials. The highways are filled with trucks carrying highly flammable fluids, deadly poisonous chemicals, explosives and unstable industrial chemicals. Millions of tons of these materials travel the roads yearly. I think those present more dangers to the public than the few shipments we make each year. Only the other day a chemical truck overturned and released a poisonous gas covering miles, and several people were killed.

Newscaster: What is the chance of an extra severe accident occurring and radioactivity being released?

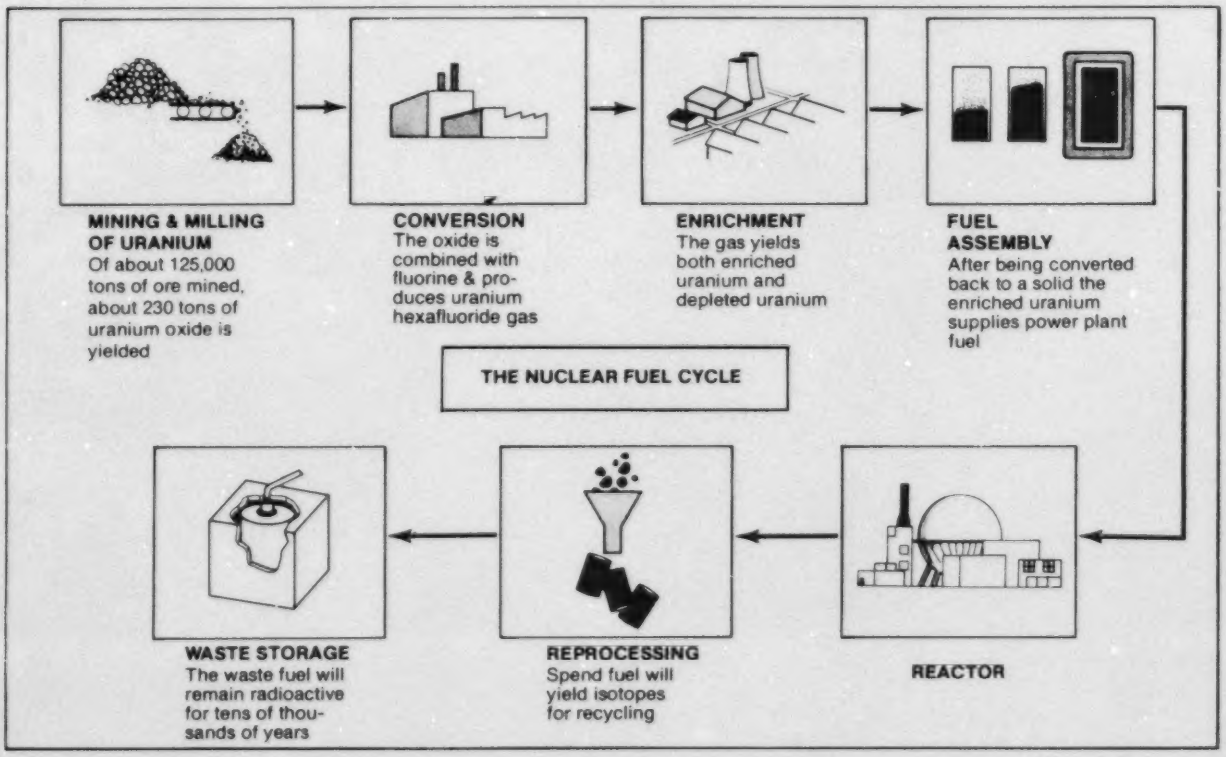
Spokesman: Our government calculations show that such an accident might occur once in 4,000 years. This is based on figures for the year 2,000 when 1,000 nuclear plants are in operation. So there doesn't seem to be much to worry about for now or in the future.

Newscaster: That figure is for a serious catastrophe. What are your estimates for lesser accidents? And how many shipments are made each year?

Spokesman: According to our estimates, for every 20 years a plant is in operation, a loaded cask would be involved in a truck accident. Accident estimates involving rail or barge shipments are much lower, about one in every 170 years for each nuclear plant.

Representative: To answer your question on the number of shipments we make, our plant at Lakeview makes 60 truck shipments, 10 rail shipments and 5 barge shipments. We are cretainly not crowding the roads. A coal power plant for example uses thousands of trainloads of coal each year.

Newscaster: Thank you, gentlemen, for your informative comments. Hopefully, you have dispelled the fears of many people.


MINING & MILLING OF URANIUM
Of about 125,000 tons of ore mined, about 230 tons of uranium oxide is yielded
CONVERSION
The oxide is combined with fluorine & produces uranium hexafluoride gas
ENRICHMENT
The gas yields both enriched uranium and depleted uranium
FUEL ASSEMBLY
After being converted back to a solid the enriched uranium supplies power plant fuel
THE NUCLEAR FUEL CYCLE
WASTE STORAGE
The waste fuel will remain radioactive for tens of thousands of years
REPROCESSING
Spend fuel will yield isotopes for recycling
REACTOR

Part II: The Nuclear Power Controversy—Section B

Traffic Jams — An Increasingly Common Occurrence

Dilemma 1: Governor Curtis' Dilemma

The demonstration has completely brought to a stand-still all movement of traffic on Highway 237. A health and safety hazard has been created, because no vehicle can get through over the stretch of 15 miles, not even ambulances or firetrucks. The demonstrators have stated that they will continue to block traffic until the government outlaws trucks carrying radioactive waste materials. The governor recognizes the near impossibilities of such demands because the "spent" fuel cannot be left at the power plants which have no long term storage or reprocessing facilities. With five nuclear power plants in the state this would create a more critical situation.

To stop the demonstration the Governor considers calling in the National Guard to arrest the demonstrators. Should Governor Curtis take this action?

Questions for Discussion (Dilemma 1)

- What should be the Governor's most important concern when making his decision? Why?
- As the Governor of the state, should he make sure that the laws are obeyed? Why or why not?
- Is it ever right to disrupt traffic in order to make a protest heard? Why or why not?
- Often, when soldiers or police are called in to stop demonstrators, riots break out and people are injured. Who should be blamed if injuries occur? why?
- Should the possibility of an accident involving a shipment of radioactive materials be considered by the Governor in making his decision? Why? or why not?
- If the demonstrators are arrested, how should they be punished? Why?
- If during the demonstration an ambulance is unable to get to the aid of a heart attact victim, who should be blamed? The demonstrators? Operators of the nuclear plant? The governor?
- If the demonstrators object to the shipment of radioactive materials, should they also object to shipments of other types of dangerous materials? Is there a difference? Why or why not?
- The demonstrators are concerned about the health and lives of the people using the roads. Shouldn't that be enough reason for what they are doing? Why or why not? Should they continue their protest until some action is taken?

Reading 3: Disposal at Eggertown

Governor Curtis, working with the State's Power Commission and the power companies, has proposed a solution for disposal of radioactive waste. The solution will also eliminate the need to transport the waste to the far away government operated reprocessing plant. A "diversified fuel management center" will be built to reprocess the fuel as well as to serve as a long-term storage site. Everything will be located in one area rather than scattered around all over the country. This plant will be near the Lakeview nuclear plant and also the other plants in the state. Waste in the spent fuel rods will be brought here and separated chemically. Uranium and plutonium can be recovered and used again as reactor fuel. Remaining unusable liquid high level radioactive waste will be converted to a solid form according to the rules of the Nuclear Regulatory Commission. The solid waste can then be permanently disposed of underground.

One of the major problems has been finding a suitable place for disposal of the solid wastes. Presently they are stored at a government waste repository in sealed canisters, awaiting permanent storage. With the many nuclear power plants now in operation, space in the facility is becoming scare. A number of ways for permanently storing the waste have been proposed such as burial in salt mines or arctic ice caps or sending them out into outer space.

A recent study concluded that burial of the waste in granite rock a thousand feet below surface would be a good solution. The remote Mt. Morain area outside Eggertown was selected as the best site for the reprocessing plant and permanent storage.

The governor's proposal has been presented at a public hearing. At this hearing the local people gave their different opinions.

Excerpts from Transcript of Eggertown Public Hearing:

Mr. Jacobs: I talked to one of the officials on the study team. He assured me that the hard granite formations here are geologically stable and once the canisters are buried they will remain undisturbed essentially forever. The hard rock is supposed to be better than salt formations where water can seep through and dissolve the salt.

Mr. Benton: Burying the steel and concrete canisters a thousand feet down may seem pretty safe now, but we still can't be sure about how the earth will change. We are not in an earthquake area, but I remember way back in 1930 when we did have our first small quake and dishes in the kitchen cupboard came crashing down. What would a large earthquake do to those storage containers?

Mrs. Crystal: The stream on my farm drains from Mt. Morain. That water will be contaminated if anything goes wrong with the buried canisters. The stream can carry the contamination a long way, and we will not be the only people affected.

Mr. Tenney: Building the center here will be good for us. I've been thinking about moving away from here. The farming hasn't gotten any better. I barely can get by to support my wife and kids. If that plant were built here I could get a good steady job. I grew up here in Eggertown; it's a good friendly place to live and the scenery around here can't be beat! But if I can't make a living I guess we'll have to move on.

Mr. Paine: Jobs here are scarce and getting scarcer. Ever since the flour mill shut down nine months ago I've been out of a job. There doesn't seem to be any hope for jobs unless some big project comes along. I'm not the only one in this mess. There are many just like me sitting around waiting for work.

Ms. Morgan: If the facility were located here, we would be helping ourselves as well as the rest of the country. All that radioactive waste sitting above ground would be less dangerous if safely and permanently taken care of. Such a facility has to be put somewhere so it might as well be here. A boost in our economy is certainly needed.

Mr. Gelder: I'm afraid I can't agree with you, Ms. Morgan. Having the reprocessing plant here will not be helping us at all. Reprocessing of unused uranium fuel releases pollutants into the water and gases into the air, many of which are radioactive. Our people will be exposed to increased amounts of radiation. Our water and air has been fresh and clean; we don't need to dirty it, especially with radioactivity. You must also realize that you're making a decision for people who will be living thousands of years from now. Maybe Mt. Morain will have changed drastically then and the casks somehow may rupture. Levels of radioactivity would surely be be high and have deadly effects on all living things. You must remember that the half-life of plutonium is 24,000 years.

Mr. Paine: Mr. Gelder, you can talk about the years in the future because you own the largest dairy in the county. You don't have to worry about a job and feeding your family.

Mr. Gelder: But don't you worry about your health and the health of your children? I don't think we should trade our good life for the mess of plutonium we didn't produce. We're not using any of that electricity from the nuclear plant and yet will be saddled with that radiation for all time.

Ms. Dole: How to keep the radioactivity from escaping hundreds of years from now is a good question. Will we be sure that the place will always be properly guarded? Even when the plant is no longer used, parts of the plant will be highly radioactive. They will have to figure a good way to decontaminate that. Maybe the entire plant would have to be buried in the granite.

Ms. Baller: As an economics student I've been concerned with what our country will do when it runs short of fuel sources. Oil is not going to last forever and uranium ore is not abundant. Reprocessing of the spent nuclear fuel is necessary because we will be able to re-use the uranium which would otherwise be discarded. The uranium that is now mined can be useful much longer. This will mean lower mining and transportation costs. Transportation costs will be further cut by having the reprocessing plant and storage facilities all in one place. It makes good money sense to locate all these activities in a single center. The cost of building and then guarding one place is less than that for two places.

All this would affect the cost of electric power. Lower electricity costs are important in everything we do. It means lower prices on food, clothing and things we use. Even if we don't use the nuclear generated electric power directly, we use the products that are produced by that power.

Ms. Adams: You may put a price on goods we buy and living comforts, but can you put a price on the dangers we may be exposed to, and all in one place? There are hazards in the reprocessing process such as plutonium fires, tank leaks, acid spills and filter failures. According to the officials at the Nuclear Regulatory Commission, people in the surrounding area would not be seriously affected by plant accidents but plant workers could be exposed to high radiation doses and even be killed.

The other waste materials have to be cooled for a long time before they can be solidified. The cooling process could fail and explosions could result. It is possible that the liquid holding tanks might spring leaks.

We would also have quantities of plutonium in a concentrated form. That's potential bomb material and very tempting to anyone wanting to terrorize or blackmail the country. Stealing plutonium here would be more desirable than stealing a truckload of "spent" fuel which has to be reprocessed to extract its plutonium. The center would have to have a foolproof guard system. We would have to trust that the designers have thought of every possible type of defect in the system.

If we have a diversified full management center we are asking for not only possible dangers now but also future dangers when the materials are left in permanent storage.

Dilemma 2: Mr. Frank's Dilemma—To Sell or Not to Sell"

The citizens of Eggertown are about to pass a resolution on the diversified fuel management center. As far as Mr. Frank could tell, the poverty and high unemployment of the area make the proposed center very attractive. Personally, Mr. Frank is not sure he likes the idea of an industry that has so many possible hazards. However, as an influential person in the community whose family has lived there for generations, he could convince many townspeople to go along with his opinion.

Furthermore, the proposed site will be located on part of the Frank farm. Mr. Frank has been trying to sell his farm without any success for many years. This would be his one big opportunity to finally retire and move. His invalid wife has been wishing to leave this remote northern rural community for the warm climates of the south which is better for her health. Money from the sale would also pay off the doctor bills that have piled up. Mr Frank knows that he can't do as much farm work as he did in his younger days and the farm doesn't produce enough to hire extra help. He would go further in debt as each year passes. Sale of the farm would solve all his problems.

If he supported the campaign in favor of building the center, the resolution would easily be passed. Should Mr. Frank support locating the center here? Why or why not?

The Farm — Fewer and Fewer Each Year

(Your teacher will distribute Worksheet #2, *Effects of a Diversified Fuel Management Center,* to be completed when you meet for your small group discussion.

Use the worksheet to help you develop the reasons for supporting the decision Mr. Frank should make.)

Questions for Discussion (Dilemma 2)

The center will bring many changes to the community. What effects should be important for Mr. Frank to consider? why?

- Should Mr. Frank consider the needs of the rest of the country when making his decision? Why or why not?
- From Mrs. Frank's viewpoint, how should her husband decide? Why?
- If selling the farm for a good price is the solution to all of Mr. Frank's money problems, shouldn't that be good enough reason for him to support the resolution Why?
- What responsibility does a well-respected citizen have towards the people who trust him? Why
- Should the prospect of more jobs in Eggertown be an important concern in Mr. Frank's decision? Why or why not?
- Should Mr. Frank's conscience bother him if he made the decision based on the thought of getting a good price for his farm? Why or why not?
- If Mr. Frank decides not to support the Center and keep the farm going as best he can, should he be forced to sell if the rest of the townspeople vote in favor of the Center? Why or why not?
- Should Mr. Frank be concerned about what might happen to the buried waste thousands of years from now? Why or why not?
- If Mr. Frank is really bothered by the possible problems with such a center, should he raise his objections or remain quiet? Why or why not.

Reading 4: The Radioactive Waste Storage Situation — A Scenario in Outline Form.

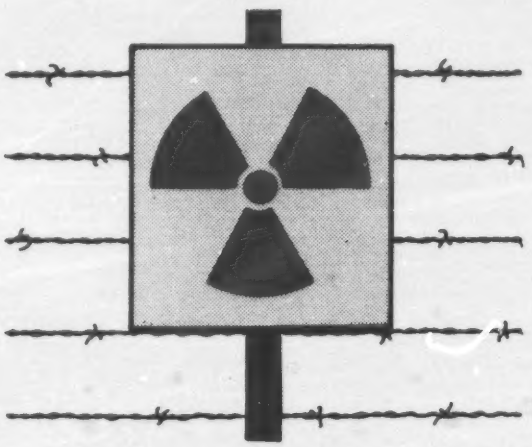
- Constructions of large scale commercial nuclear reprocessing plants for high level radioactive waste have been delayed because additional safety studies are needed.
- The one operating commercial nuclear reprocessing plant has been closed down two years also for design changes and is not expected to reopen for several years. Other reprocessing plants are government operated.
- Millions of gallons of high level radioactive waste are being held at government storage facilities awaiting permanent disposal. Most of this waste has come from military uses of uranium.
- The program to solidify the liquid waste is behind schedule. A sizeable portion of the liquid waste is still kept in tanks of the older carbon-steel design. Some are over 35 years old.
- A suitable method for permanent disposal of radioactive waste has not been selected. Each method has a different type of disadvantage.

Outer space — It will cost about $10,000 to send one pound of material into space. A typical nuclear reactor (1000 megawatt) produces 70 pounds of solid waste each year. But this material must be held in protective containers that weigh hundreds of pounds. Cost estimate for sending waste into space is over a million dollars each year for each reactor. There is also the question of safety. If anything goes wrong the rocket capsule could very well land back on earth.

Burial in arctic glaciers —Safety of this method depends on unchanging climate conditions. Sudden warming could melt or move the glaciers.

Burial under the sea in underwater valleys -This method is more difficult to monitor constantly. Also, controlling a deep sea site is a near impossibility.

Burial in salt mines or hard rock — A site must be found where there will be no chance of the waste coming into contact with underground water supplies. Also, the site cannot be disturbed for at least 250,000 years. What will happen if thousands of years from now the grounds are no longer guarded and people cannot read our "DANGER" warning signs?



Dilemma 3: Is the Water "Hot"?

Joe Carns and his best friend, Tom Doolittle, were hot, dusty, and exhausted from their two-day hike through the Canyon Caves when they came onto Handord Creek. The water was cool and inviting, the perfect refresher for weary travelers.

"Come on! Let's jump in," shouted Tom as he ran towards the water. Joe followed behind and suddenly saw the sign "Danger: Do Not Use Water." "Stop!" Joe called to his friend. "Don't go in!" He realized, on seeing the sign, that they had entered into restricted government property when they wandered off the main trail. This was near the storage facilities for high-level radioactive waste materials. The newspapers had just reported that leaks in the older storage tanks had been discovered and that tests were being conducted to check whether any radioactive waste had seeped into the nearby waters.

Tom had not heard him, and by the time Joe got down, he was already splashing about the rippling stream. When Joe told Tom about the possibility of radioactive contamination, Tom was not concerned. "They put the sign up just to keep people off the property," he said.

On their way home Joe tried to convince Tom to go to his doctor to check if he had been exposed to radioactivity. Tom would not hear of it. "I can't let my parents know that we left the main trail. I had promised to stay only on the marked paths. If they find out, they will not let me use the family car again. So don't let a word of this get out. You're my friend—you have to promise me."

Joe promised, but all the way home he could not help tinking about the possibility that the water was contaminated. He felt that Tom should be tested. If he had been exposed, he could be treated right away. But Joe knew his friend was counting on him to keep his mouth shut.

Should Joe tell Tom's parents and risk Tom's losing his driving privileges? Why or why not?

Questions for Discussion (Dilemma 3)

- Is it important that Joe keep his promise to Tom? Why or why not?
- Should good friends ever break a promise to one another? Why or why not?
- Are there ever times when a promise should be broken? Why or why not?
- Should Joe tell if he knew that his parents would also punish him for leaving the trail? Why or why not?
- Should Joe tell if he knew that people are fined or imprisoned for entering a restricted government area? Why or why not?
- From the point of view of Tom's parents, what should they want Joe to do? Why?
- Is it right for Joe to interfere with a decision made by another person? Why or why not?
- Would it make a difference if Joe had persuaded Tom to leave the trail? Why or why not?
- From the point of view of the people operating the storage facilities, should Joe tell? Why or why not?
- If, on the way home, the two boys had an argument and Tom punched Joe so hard that his nose broke, should that change the decision that Joe makes? Why or why not?

Dilemma 4: Who Can Be Blamed?

Joe Carns decided to go ahead and tell Tom's parents. It turned out that indeed Tom had been exposed to radioactivity. Fortunately, he was exposed to a very small amount and did not become severely ill.

Tom's parents were very upset by the fact that radioactive liquid waste materials were stored in the area and not properly contained. They decided to bring the case to court and demand that the government nuclear agency pay them one million dollars in damages and fire the manager in charge of the storage facility for negligence.

At the court hearing, Bob Mailer, manager of the storage facility, claimed that it was not his fault that the wastes were still held in temporary storage tanks. He argued that the liquid waste could have been converted to solids and permanently disposed long ago, but the construction of the proposed reprocessing plant was held up by the residents of Eggertown.

"This would not have happened," he said, "if people did not raise objections every time a nuclear facility is proposed." "No one wants storage or reprocessing plants in his own area, but everyone wants and uses electricity. We are only following instructions from the government and the citizens."

"Although we knew that the tanks had leaked, we couldn't do anything about it. Tom Doolittle had no right to trespass into a restricted area."

Should Mr. Mailer be fired because Tom Doolittle was exposed to radioactive material? Should the government be required to pay the million dollars?

How should the court judge decide?

Questions for Discussion (Dilemma 4)

- Should Mr. Mailer be responsible for what happens to people who trespass into a restricted area? Why or why not? What if Tom became permanently disabled or died?
- Should people be expected to heed warning signs? Why or why not?
- If Mr. Mailer knew that there was a possibility that people might wander into the remote area, should he have had it heavily guarded? Why?
- It is ever possible to guard against all potential accidents? Why or why not?
- Would it make any difference in the decision if there had been wire fences and the boys climbed over? Why?
- Suppose Mr. Mailer had gone to the Nuclear Regulatory Commission and had warned them about the possibility of the tanks leaking. Nothing was done because Congress didn't want to spend the money. Who then should be responsible for Tom's injury? The NRC? Congress? The taxpayers? Why?
- If it turned out that Tom required extensive medical treatment as a result of his injury, who should be responsible for his medical bills? Why?

Alternative Dilemma

Suppose that the radiation had leaked into the water supply of a nearby town, but the leak had not been discovered until several weeks later when many residents had come down with radiation illness. Who should be responsible for these people? Is there any way that the people can be adequately compensated for their injuries?

If the residents in the area had to move away and establish homes elsewhere, who should pay for relocating the residents? The Power company that produced the waste? The government? People who delayed the process for permanent disposal?

Part III: New Showdown in the Southwest

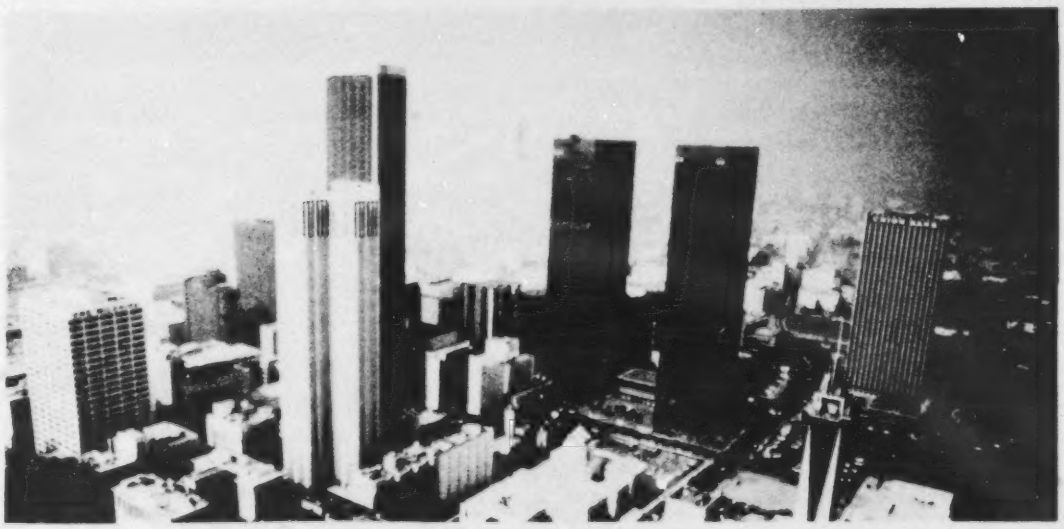
Reading 1: "The Shootout at Four Corners" *—Section A

During the 1950s, Southern California, especially the Los Angeles area, was experiencing a period of tremendous growth. The population of the area was expanding rapidly. The famous (or perhaps now infamous) Los Angeles Expressway was viewed by highway engineers of the day as the super-highway of the future. It was their response to getting the growing masses of people around the area. Los Angeles was also becoming extremely important economically. Simply, it was a blossoming metropolis that many believed would one day rival and even surpass the established metropolitan centers of the eastern United States.

Growth in the Los Angeles area was also evident in other ways. Most noticeably was its consumption of enregy—expecially the huge increases in the use of electricity. To make things even worse, the number of automobiles in use was on the rise. With the increase in automobile traffic and rising affluence, Los Angeles was pushed into the forefront in another area: it was emerging as a national leader in air pollution.

The rate at which electrical energy consumption increased was incredible. The need for electricity doubled every nine years! Let's think about that for a moment. What do you think would happen if the amount of money your family needed to live on were to double every nine years? Suppose that when you were born, providing for your family's needs required $10,000 each year. When you reached nine years of age your family income needs would become $20,000 each year. When you reach 18 years of age that figure would jump to $40,000 per year. By the time you, perhaps, became a parent, your family income needs would soar to $80,000 each year. Do you think you could afford to live under such circumstances? Do you think that the wage earners in a family could possibly keep up with such growth demands? How? If all family members took extra part-time jobs could they solve the problem? Or, would you simply be fighting a battle which you have no chance of winning? Can you think of any ways that a family living under these conditions might be able to solve the problem? What if the family changed its life-style to some degree so that it wouldn't need as much money to live? How about a combination of several approaches?

For example, get part-time jobs for all members of the family, cut down on all non-essential living expenses, make other life-style changes? Suppose you had to cut back on your use of energy?



Metropolitan Los Angles, California

Activity 1

A Case of Consumption

The following table lists some of the more common electrical home appliances and the estimated amount of electricity each uses in a year.

- Select those that are used in your home and list them on a separate sheet of paper.
- Add up the total number of kilowatt hours used by those appliances. What is your approximate yearly electricity consumption?

(Are there other appliances that you use frequently that are not listed? What are they? How many kilowatt hours are used)?

Suppose the electric company could not supply its customers all the electricity needed and therefore asked that each household reduce its use of electricity by 25%. Can you suggest some ways in which you and your family can reduce the use of electricity?

*Adapted from "A Review and a Preview: The Shootout at Four Corners." *Energy — Environment Sourcebook*, Washington, D.C.: National Science Teachers' Association.

• To find how much electricity you need to save, divide the total kilowatt hours by 4. What is this number?

• Select those appliances that you will not use and list them on the worksheet provided by your teacher. (Worksheet #3 *Reducing Your Use of Electricity)* Continue listing the appliances until the number of kilowatt hours add up to the figure you found in #3. You may use some appliances less, such as only one-quarter or one-half of the time. In those cases explain (on the worksheet) what you will have to do to achieve the saving.

• Answer the questions at the end of the worksheet.

• Show your original appliance list to your grandparents or older person. Ask them what appliances their family did not have when they were your age. From their answer figure out how much more electricity your family uses. Compare the amount of change.

• Compare the amount used today with the amount used in the past.

Amount used today (used by your family)
—Amount used in the past (used by your grandparents)

Difference

How much more electricity do you use today?

• Compare the amount of increase by dividing the amount used in the past into the amount used today.

$$\frac{\text{Amount used today}}{\text{Amount used in past}} = \text{Number of times consumption has increased}$$

• Has it doubled? Tripled?

Electrical Consumption for Some Common Home Appliances

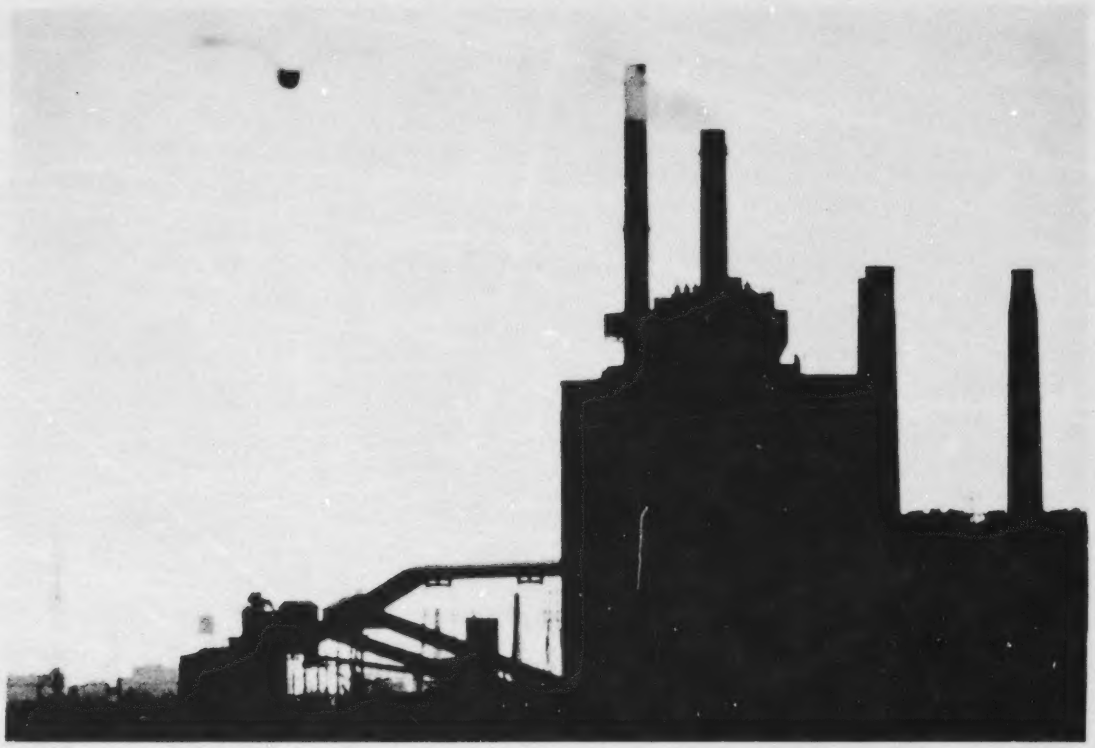
Appliance	Estimated Annual KWH Consumption
Air Conditioner, Window	940
Attic Fan	291
Bed blanket	147
Broiler	100
Carving Knife	8
Clock	17
Clothes Dryer	993
Coffee Maker	140
Deep Fat Fryer	83
Dehumidifier	377
Drill, Electric	65
Dishwasher	363
Fan, Attic	291
Fan, circulating	43
Fan, furnace	450
Fan, window	170
Floor polisher	15
Food blender	15
Food freezer (15 cu.ft.)	1,195
Food freezer, frostless (15 cu.ft.)	1,761
Food mixer	13
Food waste disposer	30
Frying Pan	186
Grill, sandwich	33
Hair dryer	25
Heat lamp	13
Heat pump	13
Heater, radiant	176
Heating Pad	10
Hot Plate	90
Humidifier	163
Iron (hand)	144
Lighting	360
Oil burner or stoker	410
Radio	86
Radio-phonograph	109
Range	1,175
Refrigerator (13 cu.ft.)	728
Refrigerator (12 cu.ft. frostless)	1,217
Refrigerator-freezer (24 cu.ft. frostless)	1,828
Roaster	205
Saw	65
Sewing Machine	205
Shaver	18
Sun Lamp	16
Television (B & W)	362
Television (Color)	502
Toaster	39
Tooth brush	5
Trash Compacter	50
Vacuum Cleaner	46
Waffle Iron	22
Washing machine, automatic	103
Washing machine, non-automatic	76
Water Heater, standard	4,219
Water Pump	231

If you know the amperage rating of any appliance, you can estimate the kilowatt hour consumption by using the formula

$$\text{KWH} = \frac{\text{Amps} \times \text{volts}^* \times \text{hours of use}}{1000}$$

*Use 110 or 220 volts, whichever applies.

Information in the above chart is from The Edison Electric Institute



Coal Fired Electricity Generating Plant

Reading 2: "The Shootout at Four Corners"—Section B

How did the Los Angeles area respond to its problem of an energy consumption doubling every nine years? They built more electrical generating plants—more plants to produce more cooling in the summer, more heat in the winter, to turn more motors in dustry, to attract more people to the area, and on and on . . .

The decision makers in California could see no problem with such growth and, in fact, they welcomed it as a sign of success. They certainly had an ample supply of oil and natural gas resources in the area. They ignored, however, some important meteorological (weather) and geographical facts. Because of the shape or layout of the land (Los Angeles is located in a basin, or large bowl), and because of the air movement patterns in the area, there was a tendency for smoke and air pollutants to hang long in the air above the city. As a result of this situation, most people in the Los Angeles basin resisted burning even relatively clean fuels such as gas to generate their own electricity. Clearly, 10 years before the rest of the nation, Los Angeles was hung on the horns of a major energy-environment dilemma.

Help was not long in coming, however. Beyond the mountains and deserts to the east, in an area surrounding a place called Four Corners (the point where New Mexico, Colorado, Utah, and Arizona join) were enormous deposits of coal. This coal was not only a potential source of energy, but it underlay a relatively uninhabited, arid land. Equally important, the Four Corners area had no air pollution problem. In addition, the Arizona Public Service Company was building a huge coal-fired generating plant there, and plans were made to transmit the electrical power by high voltage transmission lines to . . . guess where? Los Angeles and other areas in the southwestern United States.

The Four Corners electrical generating plant near Farmington, New Mexico, began operation in the mid-1960s. In addition, there were also at that time five other huge plants either on the drawing boards or under construction. By 1969, the citizens and residents of the Four Corners area realized that massive social and environmental changes were taking place. These changes added to the tremendous amount of air pollution being produced by the Four Corners plant and resulted in numerous complaints by many of the local residents. These complaints were loud enough to attract national attention of the press and the mass media.

Particularly sensitive was the proposed location of one of the largest mines—the "Black Mesa"—ancestral home of the Hopi and Navajo Indians. The Black Mesa is considered sacred by many Indians—especially the elders and more traditional members of the Hopi and Navajo people. The Sierra Club—a large conservationist and environmental organization boasting a national membership—and other environmental organizations rallied to oppose the Black Mesa plant. At the same time the Governor of New Mexico proposed a ban on any further construction of coal plants in the region. The battle was on!

Controversy over the plants in the Four Corners area was at its height several years ago. It can still be very instructive to us because it embodies many of the components of the enlarging energy-environmental dilemma that we now face as a country. It also illustrates quite clearly the mixture of fact and emotion, reason and irrationality that is erupting on a national scale.

Let's look at how different people representing different interests viewed the problems of the Four Corners area.

An advertisement placed in The New York Times on Thursday, May 20, 1971, and sponsored by the Black Mesa Defense Fund, included the following:

". . . LIKE RIPPING APART ST. PETER'S, IN ORDER TO SELL THE MARBLE.

"So that the world can have still more of Los Angeles, Las Vegas, and Phoenix, six gigantic coal-burning power plants and three huge strip-mines are underway at and around Black Mesa, Arizona. When operative, the complex will spread more deadly smog and soot than currently put out in New York and Los Angeles combined, across what is now 100,000 square miles of open country, the last pure air in America.

"Affected by the smog will be six national parks, 28 national monuments, the Lake Mead and Lake Powell recreation areas, and Grand Canyon; the places people escape to are being sacrificed to make more of what they escape from. Also being sacrificed on behalf of urban growth: the sacred religious shrines of the Hopi and Navajo Indians, who had thought that it couldn't happen again."

The Federal Power Commission presented as part of its argument during the hearings before the Senate Committee on Interior and Insular Affairs the following:

"Demands for more and more electricity to meet industrial needs for production of goods and services, society's desires for greater comforts and conveniences, and commercial uses associated with the high standard of living in the United States have resulted in an approximate doubling of electric loads in each decade for a number of years. Forecasts indicate that this trend is likely to continue throughout the remainder of the century.

"The Federal Power Commission's West Regional Advisory Committee for the National Power Survey has confirmed that the western portion of the United States will likely follow the national trend and that electric generation in that region will in 1980 be about twice and in 1990 about four times that in 1970. In the past, much of the electricity requirement of the western states has been met by hydroelectric facilities but fewer economically justifiable hydroelectric developments remain for the future, and a greater share of electricity production must come from thermal power plants. The Regional Advisory Committee has projected that electricity production from such sources will increase by a factor of about seven during the next 20 years. Coal and nuclear fueled plants are expected to satisfy most of the increased requirement. Most of the nuclear generation will be installed in California and the Pacific Northwest. Coal burning plants are expected to be built outside the California Subregion and about half of the future increase in coal fired generation in the Rocky Mountain area is planned to serve loads in California."

Asa Bazhonoodah, an 83-year-old Navajo woman, presented her feelings and those of many of her people to the Senate Committee in the following words:

"The Earth is our mother. The white man is ruining our mother. I don't know the white man's ways, but to us the Mesa, the air, the water are Holy Elements. We pray to these Holy Elements in order for our people to flourish. . ."

And to essentially round out the range of positions, Mr. Mack Ward, a druggist in the town of Page, Arizona, digressed from his prepared statement before the Senate Committee and remarked:

"I would like to remark here, it is not in the statement, but I am proud of our nation as an industrial complex, very proud.

"We do not dare stop this forward progress. We must continue to create new jobs for the upcoming generations. Without electric power this cannot be done. We must have production with controls.

"We have faith in our industrial community and in the Federal Government which is a participant in this project. We know that through their continued efforts and our continued demands that pollution from the burning of fossil fuels can and will be controlled and that the Navajo generating station will be the model plant of its kind in the industry."

Numerous other statements and positions were presented to the Senate Committee on Interior and Insular Affairs. These statements varied from emotion to reason, doubt to belief, outrage to approval. Interestingly enough and as so often happens, there were mountains of "undoubtable" facts to support any and each of the positions given. In fact, people of differing and opposing positions often used the same facts to support their conflicting views.

The bulk of the positions presented can be summarized as follows:

- smoke and haze will foul the once-clear and blue desert skies;
- important landmarks like Shiprock and the beautiful snow-capped Sangre de Cristo Mountains would be obscured;
- high voltage transmission lines stretched across the landscape would completely ruin the beautiful countryside;
- strip mines only open huge gashes in the earth;
- long pipes carrying coal mixed with precious water that is in critically short supply in the area would be wasted transporting coal from mines to plant.

Not all of the people, however, had negative feelings about the changes that would be brought about by building the proposed power complex. In fact, many of the local residents favored the power complex. These people could see new tax monies coming in and new jobs—welcomed sights in a region officially classified by government agencies as economically depressed. If they looked further ahead, they could see in addition to the power complex, growth—more buildings and industries needing electric power and more people to feed with foods grown with water from the Colorado River, using pumps powered by electricity from the new power plants.

The Four Corners dispute might now seem like "old hat" since the main "battles" were fought in the middle and late 1960s. While the main "battles" were fought a decade or more ago, the argument is still going on. In addition, its elements include almost all the facts and trends, fears and opinions that fuel the "Great Energy Debate" in which we are now engaged. For this reason we

briefly summarize what Four Corners was all about and point to the further developments and similar issues the you will face in the near and distant future.

The old Navajo woman, Asa Bazhonoodah, who testified before the Senate Committee, pointed out that air and water are Holy Elements to the American Indian. The non-Indian, on the other hand, sometimes seems to give as much respect to coal and electricity as the Indian gives to air and water. It is around these four elements—air, water, coal and electricity—that the Four Corners controversy revolved.

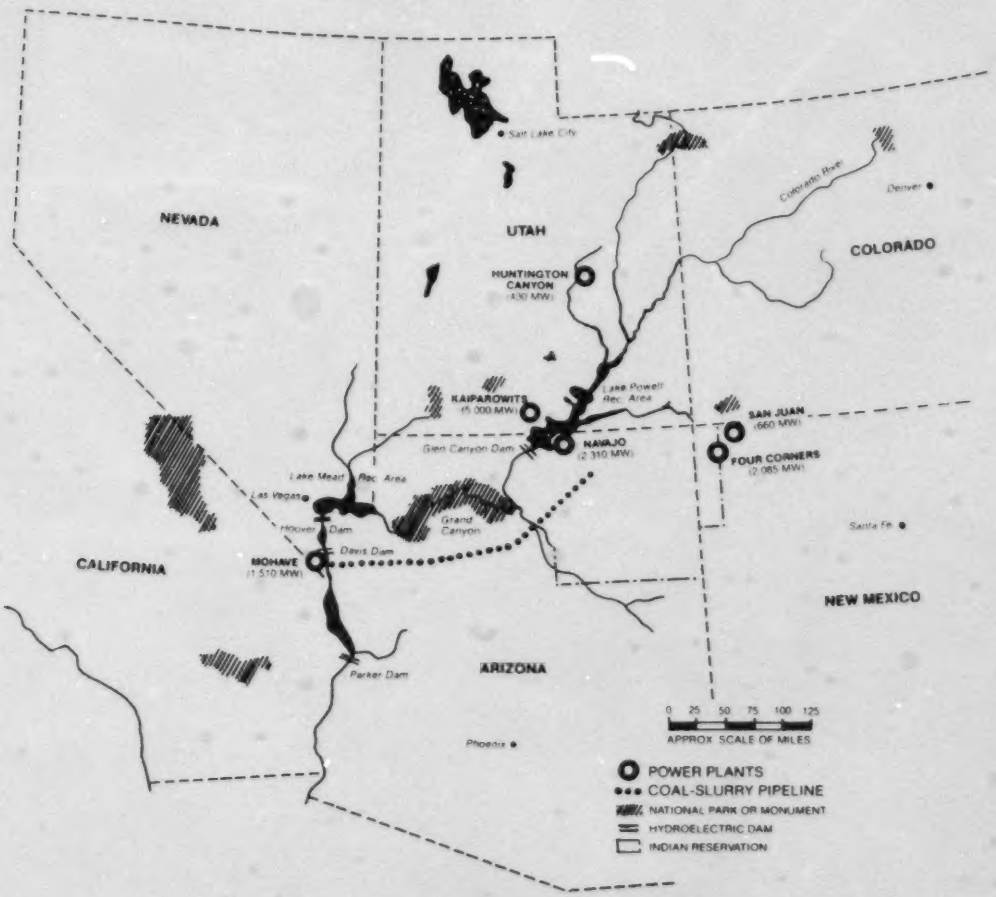
The Four Corners area contained a great store of coal—as much as 107 billion tons that can be stripped mined. This is 200 times as much coal as was consumed in the entire United States during 1970. If our yearly coal demands did not increase, for how many years might the Four Corners area satisfy the coal needs of the United States? Although the southwestern part of the United States does not contain an excess of water, apparently it does contain enough water for mining operations. Obviously, there was air—clear, pure air—in an area that had rather weak and relatively ineffective air quality controls. Finally, there was a great demand for electricity in southern California and elsewhere.

Figure 1 shows the locations of the six controversial power plants and sets the story. Since these are electrical generating plants, it would be helpful for you to have some idea of their size. During the first phase of development in the area, the power plants would be able to provide about 7,000 million watts (Mw) generating capacity. This is almost enough electric power to serve the electrical needs for the entire city of New York. Phase II of the developed program is scheduled for completion by 1980 and will roughly double this capacity.

The Four Corners plant, the first to be built, was a business success from the beginning. The cost of energy from the strip-mined coal was the lowest of any steam plant in the country. This success encouraged other utilities of the Western Energy and Supply Transmission Associates (WEST) to undertake development of the six plants shown in Figure 1. Then the storm broke.

The objections to the Four Corners plant, and to the others that followed, can be classified under four categories: air pollution, water rights, strip mining, and politics and economics. We will look briefly at each of these and at the different points of view regarding them.

FIGURE 1
Utility and Coal Projects in the Four Corners Region



Air Pollution

The first Four Corners power plant was built in the early 1960s—a period during which the country was not very sensitivie to the air quality problems that led to the Clean Air Act of 1970. The plant had emission control over the "particulates"—the small soot and ash particles which go up the smokestack. The early emission control devices were not very efficient, however, and the Four Corners plant sent an enormous plume of smoke bellowing out, blackeening those once clean desert skies. The plume of black smoke was tracked by private airplane for a distance of more than 150 miles.

The amount of particulate matter being put into the atmosphere by the Four Corners plant was reported as 350 tons per day—almost three times the total particulate emission of Los Angeles. In addition, the emission of smog-forming sulfur dioxide was 320 tons per day—about one and one-half times the Los Angeles total of 225 tons per day.

Because of the Clean Air Act of 1970, more strict air quality controls went into effect nationally. This new law forced the Four Corners plant to install more efficient emission control devices. In addition, any new plants in the area also had to conform to the new air quality laws. The problem, however, is that while it is possible to remove most of the particulate matter (the present devices now remove more than 99 percent of them), it is more difficult to remove the sulfur dioxide. For example, the "wet scrubbers" used at the Four Corners plant remove the particulates and 20 to 30 percent of the sulfur. Western coal, fortunately, is generally low in sulfur. On the other hand, nitrogen oxides which form the eye-burning chemicals in the Los Angeles smog are not removed.

If the air pollution control equipment installed in the six power plants perform up to expectations, the pollution output from these plants would be:

particulates — 73 tons per day
sulfur — 942 tons per day
nitrogen oxides — 1,701 tons per-day

These totals are roughly equal to present daily emission from Los Angeles and New York City.

Besides fouling the desert air, turning on additional power plants would obviously increase the haze. But other effects, of course, are also to be expected. These pollutants can harm both plant and animal life. For instance, sulfur oxide from the power plant emissions combines with water vapor in the atmosphere to produce sulfuric acid.

sulfur oxide + water → sulfuric acid

Hence, in addition to posing a threat to plants and animals—humans included—the acidity of Lake Powell must also be carefully watched.

However, all is not totally bad. In fact, there may even be some benefits. There is some idication that all of the smoke and ash that has been falling on the desert might be serving as a fertilizer. Vegetation near the power plants, for example, has shown an increased rate of growth since the power plants went into operation.

Dilemma 1: Even the Rain . . ."

Mesa Verde National Monument in Colorado contains the remains of the cliff dwellings of the ancient Anasazi Indians. Those dwellings have survived almost totally intact for nearly 1500 years because the clean, warm, relatively dry air has little effect on the stone and mortar dwellings. The Mesa Verde dwellings will probably last in-definitely so long as the air quality remains the same.

Lou Jackson lives near Mesa Verde. He is an amateur archeologist and strong environmentalist. Mr. Jackson had learned recently that when sulfur dioxide from coal burning combines with water in the atmosphere, a weak but damaging acid is produced. He was convinced that acid was being produced as a result of burning coal at the Four Corners plant in New Mexico.

Mr. Jackson feels that the acid was both dangerous to the health of the people in southern Colorado and to the existence of Mesa Verde—an important national monument. He began thinking about suing the power company, the State of New Mexico, and the Federal government on behalf of the people of Colorado. He feels that he has a case because pollution being produced in New Mexico was crossing a, state line and endangering people and property in Colorado. This was happening without Coloradans receiving any of the benefits of the coal burning.

Mr. Jackson realizes that it would be very expensive to take his case to court and that he would have to borrow the money to pay for the legal services. He also realizes that since this type of case has never been brought to court before, no one could give him any idea of what his chances of winning could be.

Should Mr. Jackson sue? Why or why not?

Dilemma 1: "Even the Rain . . ." Questions for discussion.

- Why should Mr. Jackson even consider taking such an action?
- Should preservation of the cliff dwelling be important to people? Why?
- Should people who benefit from the use of the electrical power be responsible for its effects? Why or why not?
- If air pollution can be stopped only by closing down the plants, what might happen if this were done?
- If Mr. Jackson wins the case, what type of penalty should be imposed on the power company, the State of New Mexico or the Federal government? Why?
- Since the Federal government represents all of us, should this mean that we are all responsible? Why?

- Is there any penalty that can adequately compensate (pay for) the damage to health and property caused by sulfur dioxide from coal burning?
- Many other states also burn coal for electricity. If the courts decide in favor of Mr. Jackson's charge, should citizens in these other states also sue? Why or why not?
- If you were a resident of Colorado should you come to the support of Mr. Jackson? Why or why not?
- If you were a resident of New Mexico, how might you feel about Mr. Jackson suing your state? Why?
- What responsibility should the power company have towards human health or the environment? Why?
- If there are so many damaging effects that come from generating electricity, should everyone consider doing without electrical power? Why or why not?

Reading 3: "The Shootout at Four Corners"—Section C

Water

In producing electricity, steam is forced through a turbine which turns a generator which then produces electricity. In addition to air (needed for combustion to occur) power plants need water as well. Their major requirement is for cooling water; the least expensive means of cooling the condenser (in which the steam exhaust from the turbine is changed back to water) is to pump water through it. Because it is in short supply and very expensive in the arid southwest, water is recycled at most of these plants through cooling towers and back for storage in a cooling pond. Nevertheless, some water is always consumed by evaporation from the cooling towers and by the wet scrubbers (about 10 percent). In fact, water demand throughout the region is increasing because of the same growth that is causing the rising demand for electric power.

Water and electric power are directly related; some of the power generated will be used to pump water from Lake Mead for irrigation. At present, it is the lack of water and the worry about air pollution that is slowing approval of the huge Karparowits Plant in Utah.

Water is an even more crucial problem for the Mohave plant, which is fed by coal shipped by a 276-mile "slurry" pipe from the Peabody Beach Mesa mine. The coal from the mine is crushed, mixed with water (to form a "slurry"), and then pumped to the Mohave plant. Since Peabody was prohibited from taking groundwater at levels about 1,000 feet, the company has sunk six wells to depths of about 3,600 feet, to tap a reservoir of clean, fresh water. The power plants were required to use deep wells; otherwise they would interfere with the Indian wells which are less than 1,000 feet deep.

The huge pumps draw about 1,500 gallons of water per minute. Some people are becoming concerned, however, about the amount of water being drawn by the deep wells. It is thought that if the deep wells are depleted, the upper water table would also be affected. Monitoring of the Indian wells has not shown any lowering to date, however.

Mesa Verde, Southwestern Colorado

Scarring the Landscape — Strip Mining

Strip Mining

What makes the southwestern coal so attractive, in addition to its abundance, is its nearness to the surface. It lies on the Black Mesa, less than 100 feet below the surface, and is easily reached by huge mechanical scoops (called draglines) that operate on the mine.

It is the use of large-capacity equipment that makes stripmined coal less expensive than underground mining. The technique of strip mining is like deep plowing. The soil and rock above the coal (the overburden, as it is called), is removed in a long trench, the coal extracted, and the overburden from a parallel trench is then dumped in the first one. The topsoil is thus buried under 50 or 100 feet of subsoil. In some parts of that arid land the term "topsoil," of course, is meaningless. Peabody Coal Company, for instance, reports that tests at their Black Mesa mine show that the fertility of the subsoil is as good as (or better than) the sandy top layer.

The amount of land involved is impressive. The Peabody Company will have to strip about 400 acres a year to provide the 40,000 tons of coal a day needed to fuel the Mohave and Navajo plants. During the projected 35-year operation, about 14,000 acres, a little less than one percent of the Black Mesa, will be stripmined. If the Utah International Coal Company, which provides coal for the Four Corners plant (from a nearby mine), and the San Juan plant mine are as productive, then the total land stripped annually in this region will be nearer 800 acres. What this stripped land will look like five or ten years from now is difficult to judge. It will depend on regulation, motivation, climate, and on other factors controlled by nature. Even with the best of intentions this dry land will be hard to reclaim. Rain is scarce and the rain that does come carries with it the danger of washing saline (salty) shale down into the surrounding land. Dust will also be a major problem.

Although land use regulations vary from state to state, in general all of the regulations are becoming more strict. Utah International's lease with the Navajos, for instance, was drawn up in 1957. That lease was far more permissive than the Peabody lease with the Hopis and Navajos on the Black Mesa.

Attitudes of the different companies also differ. At last report, Utah International had regraded only 100 of 1,400 disturbed acres, while Peabody had already regraded and reseeded 800 or so acres from the much smaller total on the Black Mesa. The Peabody reclamation effort is costing $2,500 per acre to regrade and another $50 or so to spread 25 pounds of grass seed. It is still too early to see if much of the land can be recovered.

Dilemma 2: "The People of Jolla"

The small town of Jolla is located in the hot, arid, but coal-rich region of northeastern Arizona. Jolla has changed little since it was founded in 1882. Its 350 residents live essentially as people before them did, farming and/or raising small herds of cattle. But all of this is beginning to change . . .

A giant electrical power complex is being planned for Novata 250 miles from Jolla. This power complex is to produce electricity for Los Angeles and other parts of Southern California. To produce the electricity, coal will be strip-mined from the Jolla area, crushed, mixed with water, and pumped through a "slurry" pipe to the Novata power plant. Coal is very plentiful—but water is extremely scarce. The power company feels that they can obtain sufficient water if they dig extremely deep wells and tap into the large underground water reservoirs.

Many of the citizens of Jolla became upset when they found out about the plans. They were furious that their coal and precious water was goint to be used to help the "energy greedy" people in California and elsewhere. They elected Ann Bridges to serve as their leader and spokesperson.

Ann discussed the situation with the citizens of Jolla. She also collected the signatures of many of the citizens petitioning Governor Rivera to put a stop to the power plant plans. They cited the facts that their resources—especially the scarce water—were being taken from them, endangering their land, livelihood, property, and even their lives; and that their resources would be used to help other people who didn't even live in Arizona and who didn't deserve it.

Another group of residents in Jolla welcomed the news about the power complex. Coal mining, they felt, would create new jobs, provide new income for the land owners, and help raise the standard of living in the area. They, through their spokesperson, Helen Murray, had a petition signed asking Governor Rivera to support the plan to mine the coal and send it to Novata. They felt that water would pose little problems—if deep wells were used.

Both petitions were given to Governor Rivera and both parties in Jolla waited for his decision. Should Governor Rivera stop the project or should he support it? Why?

Dilemma 2: "The People of Jolla" Questions for Discussion

- As governor of his state, what should be Governor Rivera's most important concern? Why?
- Since growth and prosperity of a state is dependent on industries and jobs, shouldn't that be a good reason for supporting the electric power plant? Why or why not?
- Shouldn't those who oppose the power plant consider how important electricity is to those states who cannot produce enough power? Why or why not?
- Suppose many people moved into Arizona and increased the need for electricity. Should Governor Rivera then approve the power plans? Why or why not?
- If the property owners can earn money by allowing their land to be mined, shouldn't that be the best reason for supporting the plan? Why or why not?
- If you were a resident of Los Angeles, should you try to convince Governor Rivera to support the plan? Why or why not?
- If the people of Los Angeles need electricity so badly, shouldn't they build their own electricity generating plants, even if it would make their already bad smog problem unbearable? Why or why not?
- If you were living in Los Angeles and because of the eye-burning smog problem had to decide between automobile driving or electricity from coal burning plants, how should you decide? Why?
- Since those objecting don't use the water in the deep wells, aren't they acting selfishly by not wanting the coal to be shipped through a "slurry" pipeline? Why or why not?
- Only a few hundred people in Jolla will be affected by the power development, while millions will benefit from the new source of electrical power. Should this be an important argument for Governor Rivera to consider? Why or why not?
- The coal mining operations will bring many changes to the people of Jolla. If they are not happy about those changes, should they be forced to accept them? Why or why not?

Reading 4: "The Shootout At the Four Corners"-Section D

People Money, and Politics

In addition to the environmental effects, other problems involve people, money, and what sometimes seems to be crosspurpose of several federal government agencies.

Money

There is, of course, money to be made from the southwestern coal. At Black Mesa alone coal should result in a billion dollars, more or less, for the Peabody Company over the 35 years of contracts with the Navajo and Mohave plants. The Indians will also make money. The royalties to be paid to the Hopi and Navajo tribes are 20 to 25 cents a ton. If the price of coal continues to rise during the contract period, the royalties to be paid to the Indians will also rise proportionately. At present the Indians are averaging $1 million a year and that figure will probably go up to $3 million a year shortly. For the 125,000 Indians in the area, this amounts to $24 per year. The annual Peabody payroll of $4 million makes a much bigger contribution to those Indians who are employed by the company. Indians make up 80 percent of the total work force.

In New Mexico, the net return to the state and to the Navajos for the plants operating there was estimated in the Senate Hearings[1] to be:

Investment	$294,620,000
Employment	532 (50 Percent Navajos)
Payroll	$5,900,000 Per Year
Rents & Royalties to Navajos	$1,180,000 Per Year
Taxes	$1,145,000 Per Year
Materials & Supplies Purchased in New Mexico	$1,300,000

The differences between the goals and values of the Page, Arizona druggist and those who bought the advertisement in the New York Times are easily understood as being the typical "Preserve the environment" interests vs. the development-growth interests. In addition to these conflicts, however, were those within and among the Indian tribes themselves. To some Indians and the Tribal Council (governing board of the Indians) the power plants and mines offered a way out of economic misery. To many other Indians, however, the plants meant leaving the traditional paths of their people. A young Navajo expressed his feelings this way:

"The Government says that we are economically underdeveloped and that we should all be overweight and have health problems like the white people. They look at our resources and justify that a good way to become economically viable is to develop our resources. Have they ever thought that the Navajos don't like to be up with the national standards in economics, education, employment, et cetera. We don't like this idea of keeping up with the Joneses, and the white man does, but we want to develop at our own pace. This is the white man's invention, to keep up with the Joneses."

It will be important, then, that in our search for energy the nation does not exploit the Indians as it has unmercifully done in the past.

Policy and politics: The plans for the Southwest power complex began slowly, took nourishment from different sources, and urgency from different needs. They involved not only the utilities, but several Federal agencies as well. These agencies came in at different stages in the project development and had different roles.

A feature of Four Corners development, and the controversy that surrounds it, is that most of the Federal agencies involved are part of the Department of the Interior. A partial roll call includes the Bureau of Reclamation, the U.S. Geological Survey, the Bureau of Indian Affairs, and the National Park Service. The Clean Air Act and the other antipollution laws of the late sixties and early seventies gave the Environmental Protection Agency a piece of the action. Since many of these same agencies will be involved in future energy-environment issues, we can benefit from an examination of their role.

The lead agency in many ways, the *Bureau of Reclamation,* had been working for several decades to spur the economic growth of the Southwestern Colorado Basin region. It had proposed the two dams on the Colorado, above and below the Grand Canyon, for instance. (This idea was eventually rejected.) The plan to develop coal resources and build generating plants was, therefore, quite consistent with its goals.

The other agencies are charged, in one way or another, more with protection than with development. The *Bureau of Land Management,* for instance, is charged with supervising strip mining, and, in general, with assuring that proper "land management" occurs. The *Bureau of Indian Affairs* supervised the coal lease and water rights contracts with the Indians. The *National Park Service* has obvious responsibilities in an area that includes many national parks and monuments. The *Environmental Protection Agency's* chief concern is defining air-quality standards and supervising the data gathering.

The main complaint about the way these agencies carried out their duties is that they have failed their charge to protect our national resources and environment. The Bureau of Reclamation, for instance, has been faulted for its commitment to its long-term plans for bringing irrigation water to central Arizona for development Alternatives, critics claim, such as less economic growth or patterns less dependent on Colorado water, have not been given serious thought.

Critics also point to the lack of muscle in the Bureau of Land Management's strip-mine supervision, to the National Park Service's failure to protect vigorously the areas under its charge, and to the Bureau of Indian Affairs for its eagerness to accept the power complex as part of its plan to change the Indian's lifestyle.

In any complex and technical issue, such as the one we have been describing, much of the information important to decision-making is held by government agencies. If the public is to play a role in these decisions, it must have access to this information. More important, if there is disagreement among the Federal agencies, it should be allowed, even encouraged, to promote its point of view. When all of the agencies are within one department, the Department of Interior, as was the case in this instance, the possibilities and opportunities for public debate apparently pose problems.

Four Corners demonstrates the clash of priorities, values, and needs; it raises a series of questions that will be raised again and again. This controversy raises the question of how these priorities should be determined.

The Four Corners area, after all, has two outstanding assets: scenery, whose sweep is enhanced by hazefree air, and those large shallow deposits of coal. Who is to decide which of these is of highest priority? Can the decision be made solely in the marketplace? It is in large part their economic clout that enabled the residents of Los Angeles to have their cake and eat it, too: to demand rapid growth in electric generating capacity and to forbid the construction of fossil fuel-burning plants in their own neighborhood. On the other hand, the weakened economic situation in the Four Corners area caused some citizens of the Southwest to place a greater value on coal and electricity than on scenery, clean air, and the lifestyle preferences of some Indians.

This scenario has larger echoes. Take, for example, the Four Corners Power Plant which burns New Mexican coal. The plant's effluent pollutes New Mexican air and the strip mining of coal disfigures New Mexican land. Only 10 or 15 percent of the electric power generated by this plant, however, is used in New Mexico. New Mexico's plight is not too different from that of the world's industrially underdeveloped countries.

What has happened at Four Corners will happen again with different characters and slightly differing pressure of energy demand.

The Great Energy Debate

With the oil embargo serving as a convenient marker, we have crossed over into a new era. We have left, perhaps forever, the era of inexpensive energy and are now faced with shortages and higher costs of energy and with the need to pay for the heavy burden we have put on the environment.

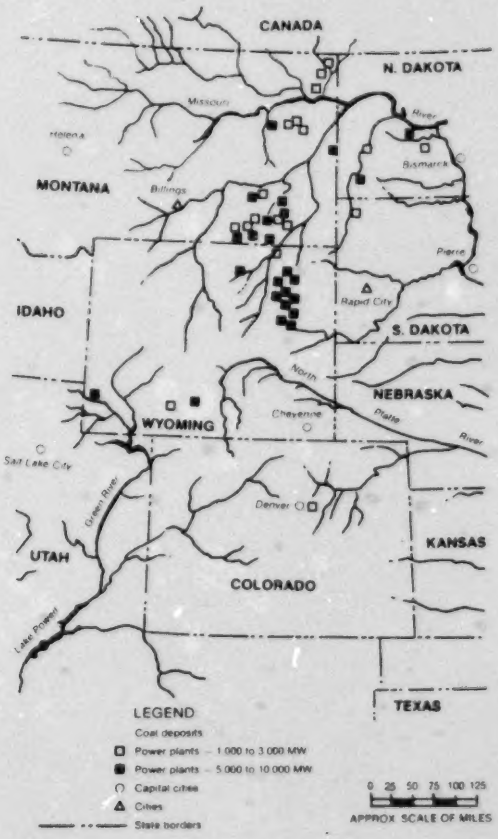
In a democracy it is necessary that all citizens participate in "debates" of such urgent importance. It is also necessary that the ultimate decision be fashioned from as thorough an understandingof the issues as is possible.

Student Activity "Cowboys and Indians"*

A conflict in priorities similar to that in the Four Corners area is now building in the North Central Plains of Montana, Wyoming, and the Dakotas. The Indians are involved again, but this time the "cowboys" or at least many of the local ranchers, are their allies.

The North Central Plains contain a gigantic coal field—one even greater than that in the Southwest. Simply, the North Central Plains contain about 40 percent of our nation's coal reserves with much of it suitable for surface mining. Since the coal fields in this area are even larger than those of the Southwest, the plans for power plant development in this area are also greater than those for the Southwest. The plan for the North Central plains call for the construction of 42 generating plants. Nearly all of the proposed plants will be located at or near the mouths of coal mines (see Figure 2). The projected generating capacity for the area is 50,000 Mw by 1980 and 200,000 Mw by the year 2,000. To visualize the enormous size of this project, let us make a comparison. For example, only Russia, the United Kingdom, and Japan presently have greater generating capacities than that planned for 1980. Japan's generating capacity in 1968 was 52,650 Mw. By the year 2,000, the North Central Plains Power Complex will, if plans are completed, be generating nearly four times more electricity than the entire nation of Japan!

FIGURE 2
Utility and Coal Projects in the North Central Plains



*Adapted from "A Review and Preview: The Shootout at the Four Corners", Energy-Environment Sourcebook, Washington, D.C., National Teachers Assoc., 1975.

Some of the plants whose locations are indicated in Figure 2 will be built to generate 10,000 Mw each—more than enough electricity for the entire city of New York. In addition, huge coal gasification plants will also be built in the area. Many of the problems you read about in the Four Corners area will also be experienced in the North Central Plains. This time, however, the problems will be magnified: more water will be needed, more land will be strip-mined, and more pollutants will be produced. In addition, the same clashes of priorities will occur between the local desires of the Indians and ranchers who own and live on the land, and the residents of distant Midwestern cities who need the energy that will be produced.

The plans for the North Central Plains have not yet been put into operation yet. You have read about what has happened as well as what is presently happening in the Southwest. Now you will "decide", in drama form at least, what *you feel* should happen in the North Central Plains situation.

Members of the class will portray different people involved in the North Central Plains "drama". You can use, in developing your "roles", the information presented on the Southwestern problem, any resources you have available—including library research, and most important, *your own ideas and the way that you feel about the situation.* Remember, you should also back up *your feelings* with data and information from reliable sources whenever possible. Your teacher will assist in assigning and developing the roles to be portrayed by each student.

Roles

1. Ms. Barbara Jackson, 2. Mr. Harry Wong, 3. Ms. Paula Sontarell—Employed by Advertising International, Ltd. (Pro Power Plant Complex Development)

4. Mr. Pete Santoro, 5. Ms. Kate Harris, 6. Mr. Mark Johnson—Employed by Promotional Enterprises, Inc. (Anti Power Plant Complex Development)

7. Senator Harry Fisch-New York, 8. Senator Cathleen Russo-La., 9. Senator Mike Morrison-N.J., 10. Senator Ted Kenner-California, 11. Senator Nancy Bernard-Mass., 12. Senator Lee Merriman-Michigan—Senate Committee on Interior and Insular Affairs

13. Ms. Joanna Bell—Widow, 33 years old, supporting two children, works in local dress shop

14. Mr. Jimmy Robbins—President, North Central Plains Chapter of Sierra Club

15. Ms. Cara Henderson—Representative of Federal Power Commission

16. Ms. Running Tall Fawn—Indian Woman, 73 years old

17. Mr. James Thundercloud—18 years old, Indian, unemployed, raised by traditional Indian parents

18. Ms. Carol Williams—Pharmacist and owner of Northwest Pharmacy

19. Mr. John Haroldson—Miner

20. Dr. George J. Pilburn—Physician and Surgeon

21. Mayor Betty Leeds—Mayor of Central City in Montana

22. Ms. Jean West—Science Teacher at Central City H.S.

23. Mr. William Watts—President of Major Electric Power Co.

24. Ms. Ella Little—Owner of Circle L Ranch

General Instructions for Role Development

Group A. Employees of Advertising International, Ltd.
Roles 1, 2, and 3.

Your company has been hired by a conglomerate of Electrical Power Companies to develop a promotional campaign *in favor* of constructing Power Plants in the North Central Plains area. Your team will develop and carry out a publicity campaign designed to convince everyone (all other groups) to support the Power Complex development plans.

Group B. Employees of Promotional Enterprises, Inc.
Roles 4, 5, and 6.

Your company has been hired by a conglomerate of Conservationist/ Environmentalist organization *against* constructing the Power Complex in the North Central Plains area. Your team will develop and carry out a publicity campaign designed to convince everyone (all other groups) to *reject* the Power Complex development plans.

Group C. Senate Committee on Interior and Insular Affairs Roles 7, 8, 9, 10, 11, 12

Your role will be to "hear" the testimony of all the "witnesses" trying to convince you that the plans should be approved as well as those who argue that the plans should be rejected. You will also, on the basis of the "arguments" presented to you, have to decide whether or not the power project plans be approved and for what reasons. Therefore, your tasks will consist of the following:

- Conduct the hearings (using the guidelines listed under "Hearing")
- Become familiar with the State you represent on the committee. Consider how a senator from that state might view the problem. Your decision should reflect the interest of your state as well as national interests.
- Become as knowledgeable as possible about the problems and facts in the North Central Plains situation. Use Figure 2

map, the reading about the Four Corners, and library information about the North Central Plains.

- Question and challenge the statements made by the "witnesses" testifying before you. You should always challenge the "witness" to explain why he/she made various statements.
- Cast your vote either "pro" (approving) or "con" (not approving) the plans and *state why you voted as you did.*

Group D. Citizens and Interest Groups Roles 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24.

Each of you should develop your own argument either in favor of or against the power plant plans. Develop you argument—"pro" or "con" as *you* perceive the situation relative to the role (e.g., mine worker, Indian, etc.) you are portraying. For example, if you are Jimmy Robbins, President of the Sierra Club, should you be in favor of or against the plan? Mr. Watts? Dr. Pilburn?

Remember, your position will, during the hearings, be challenged by other "witnesses" testifying before the Senate Committee. Therefore, make sure you are prepared to:

- state whether you support or reject the proposal
- state why you feel the way that you do
- back up your argument with any available data
- Prepare a worksheet similar to the one found on page 35 to help you organize your testimony

The Action

1. After reading the Southwest article, the entire class reads "Cowboys and Indians" and prepares the roles for the hearing.
2. Each class member selects or is assigned a role.
3. Each class member develops his/her argument according to the role he/she will assume by:
   - Analyzing the story "Cowboys and Indians."
   - Examining his/her own thoughts about the situation.
   - Thinking about and deciding how the person he/she is portraying might perceive the problem.
   - Combining personal thoughts with the role he/she is portraying
   - Reviewing and gathering data to support the position.
   - Roles 1, 2, and 3 - Advertising International, Ltd. These people might find it helpful to work together as a group.
   - Roles 4, 5, 6. Promotional Enterprises, Inc. These people might find it helpful to work together as a group.
   - Senate Committee Members. Roles 7, 8, 9, 10, 11, 12 should work *individually.*
4. While each person is developing his/her role arguments, the Promotional Groups should conduct their publicity campaigns by:
   - Distributing any "literature" they develop and prepare.
   - Holding press conferences. Here they formally present their campaign to the people present (use simulated T.V. show, radio show, etc.)
   - Holding meetings with the individual groups.
5. **The Hearing:**
   - The Senators will elect from their group a chairman who will conduct the hearing and maintain orderly proceedings. (Senators should display in front of them a name plate with their name and the state they represent).
   - After the chairman convenes the meeting he/she will call upon the witnesses to testify. (The order of apperarance should be drawn at random - using slips of paper numbered 13 to 24.)
   - Each witness will have 5 minutes to testify. (A time keeper should be appointed to insure that each person stays within that allotted time.)
   - After each testimony each Senator has an opportunity to ask the witness *one* question. At this time any witness who has already testified may also ask *one* question.
   - Each senator will keep a record of the testimony presented using the format shown. (See page 74. A well-kept record will be most helpful in deciding how to vote.
   - When the testimonies and questioning have concluded the chairman will call for the vote. Each Senator will give his/her name and the state he/she represents, cast a vote *in favor of* or *against* the proposal and provide a reason for that vote.
   - If a "tie" vote results the chairman will reconvene the meeting and ask each witness to make a summary statement. A second round of votes is called. As before, each senator will cast a vote and state his/her reason for that vote.
   - If no decisions can be made, it would be best to call the vote a "draw". The class as a whole can then discuss some of the reasons for the deadlock.

SAMPLE RECORD KEEPING SHEET FOR SENATE COMMITTEE

Name of Witness	Main Agruments	Effect on your state (+) = favorable (-) = unfavorable Why?	Effect on country (+) = favorable (-) = unfavorable Why?
"Pro"			
"Con"			

DO NOT WRITE IN BOOK

Cowboys and Indians

Sample Worksheet for Witnesses Testifying Before the Senate Committee. DO NOT WRITE IN BOOK

Role:

What is your reaction to the plan? For _____ Against _____

List the most important reasons for your decision:

1. _____
2. _____
3. _____
4. _____
5. _____

What are the data to support each reason?

1. _____
2. _____
3. _____
4. _____
5. _____

What are your needs? Why?

1. _____
2. _____
3. _____

What are the needs of your community? Why?

1. _____
2. _____
3. _____

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